THE

VETERINARY JOURNAL

NOVEMBER, 1908.

THE LATE ALDERMAN WILLIAM PENHALE, J.P., F.R.C.V.S.

It is with very great regret that we record the death of Mr. William Penhale, of Barnstaple, which occurred very suddenly on October 1, at the age of 57. Mr. Penhale was one of the leading veterinary surgeons in the West of England. He came of an old veterinary family, and graduated in 1874 at the London College, entering at once into his father's practice at Barnstaple, where his skill and genial disposition rapidly made him well known. He took a prominent part in the management of the Barnstaple Horse Shows, and for many years acted as judge at several West of England Shows.

A keen horseman and passionately fond of hunting, Mr. Penhale was instrumental in starting and supporting a pack of staghounds for the Barnstaple district. He was one of the oldest officers in the Royal North Devon Hussars, and was gazetted major in 1903. Although a busy man in his profession, Mr. Penhale found time to render useful public service in many other directions. Elected as a member of the Town Council in 1888, he was, in 1904, raised to the aldermanic bench, continuing to serve as an alderman until the time of his death. In 1901 he was elected mayor of the borough, and filled the office with great credit to himself and the town. The deceased was a Justice of the Peace, and took the chair at the fortnightly sessions only two weeks ago.

In the profession in the West of England he was well known and much sought after as a consultant and as an arbitrator by his fellow-members; his judgment was always one which could be relied upon to be fairly and conscientiously given. He was twice elected as President of the West of England Veterinary Medical Association, the officials of which were present at the funeral. The latter ceremony was very largely attended, and the whole town showed its respect for the memory of one of its most able citizens.

Editorial.

THE PROPOSED VETERINARY SURGEONS ACT (1881) AMENDMENT BILL.

THE great importance of this subject must be our excuse for again dealing with it. Our attention has been brought to the matter again by the report of the recent meeting of the Council of the Royal College of Veterinary Surgeons, and by a circular issued by a Committee formed to oppose the Bill. The circular is a long and very rambling one, and contains numerous statements which we are afraid cannot be substantiated, but which may be misleading. So far as we can ascertain, the bulk of the opposition to the Bill in its present form is due, not to the payment of a guinea a year registration fee, but to the manner of collection of it. The Register is to consist of the names of those eligible candidates who have paid their guinea each year, and a few who are to be rightly exempted from the payment. If a man fails to pay his guinea, he is to be reminded several times by post, and on the last occasion by a registered letter, that his guinea is still unpaid. If he still omits to qualify for inclusion in the Register, he has only himself to blame for the consequences, which one must admit are very serious ones. But every consideration is to be shown him, and his name may be reinstated by the payment of his fee plus a small fine for the trouble he has caused, and which, in our opinion, should be higher. Some of the opponents are of opinion that the Council would be very harsh in their administration of the "penal" clause, but we have evidence at almost every Council meeting of the exercise of their prerogative of mercy. There is scarcely a Council meeting but some name is restored to the Register, which was in most instances struck off for some misdemeanour—a much more serious matter, in our opinion, than omitting to pay a guinea. The plea of the great hardship that would be inflicted on some by the compulsory payment of a guinea a year (only half as much as a common hawker's licence, as Mr. Garnett pointed out) has now been abandoned by the most strenuous opponents.

In the circular to which we referred we are asked, after some of the provisions of the Bill have been presented in their most

unfavourable light, "Will you voluntarily accept these risks?" One of the circulars has been written on and sent to us by a correspondent who writes in answer to that: "I fail to see *any* risks." For our own part, we may say that we have implicit trust in the popularly elected Council of the Royal College of Veterinary Surgeons, and we are much more ready to leave our affairs in their hands than in the hands of a more or less self-elected opposition Committee.

Amongst the misstatements in the circular which are likely to mislead is the following: That the President (Sir John McFadyean) will be exempted from payment by the clause referring to holders of the certificate of the Highland and Agricultural Society. This is false, as has been clearly shown by Sir John himself, and also by the legal adviser to the Council. Another is that 300 members (or 10 per cent.) will be exempted from payment under the same heading. Mr. Garnett has proved that to be incorrect; there are only eighty that will be exempt, and those mostly old men who will, in the ordinary course of events, not enjoy that privilege long.

Another point is in reference to the election of Professor Dewar at the last election of the Council. The circular says he was elected "in spite of the united opposition of the whole Veterinary Press"—and "the whole of the schools." On the former of these two points we challenge the Committee to prove that we expressed any opposition to the election of Professor Dewar. On the contrary, we should have been extremely sorry if he had not been elected. Again, Professor Dewar is the Principal of one of the schools. It is absurd to say he is opposed to himself. But these are some of the misleading statements of the circular. We hope none of our readers were "rushed" by the footnote asking for an immediate response, as we are convinced they would have seen differently on thinking the matter over quietly.

General Articles.

REDWATER IN ENGLAND AND ITS CARRIERS.[1]

BY STEWART STOCKMAN, M.R.C.V.S., CHIEF VETERINARY OFFICER, BOARD OF AGRICULTURE.

After Smith and Kilborne in 1888 had demonstrated the presence of hæmatozoa (the pyrosoma bigeminum) in the red blood-corpuscles of cattle affected with "Texas Fever," which is a disease characterized by destruction of the red cells, and frequently by the presence of a visible amount of the colouring matter of these cells in the urine, similar observations were made in all quarters of the globe in connection with the disease which in England we call redwater. Five years later in 1893, the above authors showed that "Texas Fever" could be produced in susceptible cattle by inoculating them with the blood of animals suffering from or which had recovered from an attack, and that the disease could be carried indirectly by ticks. These later observations have also been confirmed in various parts of the world, particularly in Australia and South Africa, and on the Continent of Europe, and it is now generally accepted that wherever redwater is observed as a disease of cattle, one may expect to find that it is associated with and caused by the presence of piroplasms of the bigeminum type in the red corpuscles.

Curiously enough, it was not until quite recently that piroplasms were demonstrated in the red corpuscles of cattle suffering from redwater in the United Kingdom. The late Professor Nocard found them in the blood of an affected animal in Ireland. Since then their association with redwater of cattle has been frequently established in many parts of the United Kingdom, and I do not think that anyone will now seriously deny that redwater of cattle, as we meet with it in England, is caused by the presence of piroplasms in the red blood-corpuscles. But, to completely establish the analogy between British redwater and the kindred disease met with elsewhere, and now classed as a piroplasmosis, it is not sufficient to demonstrate the presence of piroplasms in the red corpuscles. One must also show that it can be inoculated to other cattle by means of the blood of affected animals, for every piroplasmosis is not inoculable, and that it can be carried indirectly by ticks. In collaboration with Sir John McFadyean, I have for the last three years been investigating redwater in Great Britain and its relation to the disease met with in other parts of the world.

A great deal of work has been done in connection with the life-periods of ticks in the field, and their relation to outbreaks of the disease. I do not propose to go fully into this, however, or to describe in detail the methods adopted, as we intend at a later date to publish a full report.

I will take first the inoculability of the English disease, as this throws some light, I think, on the failures and successes obtained with ticks. If one was to judge by the experimental results so far published in the United Kingdom, one might be led to the opinion that the analogy between redwater in England and the Texas fever type of disease breaks down over the inoculation test, and that the former possibly belongs to the type of piroplasmosis (East Coast fever) which

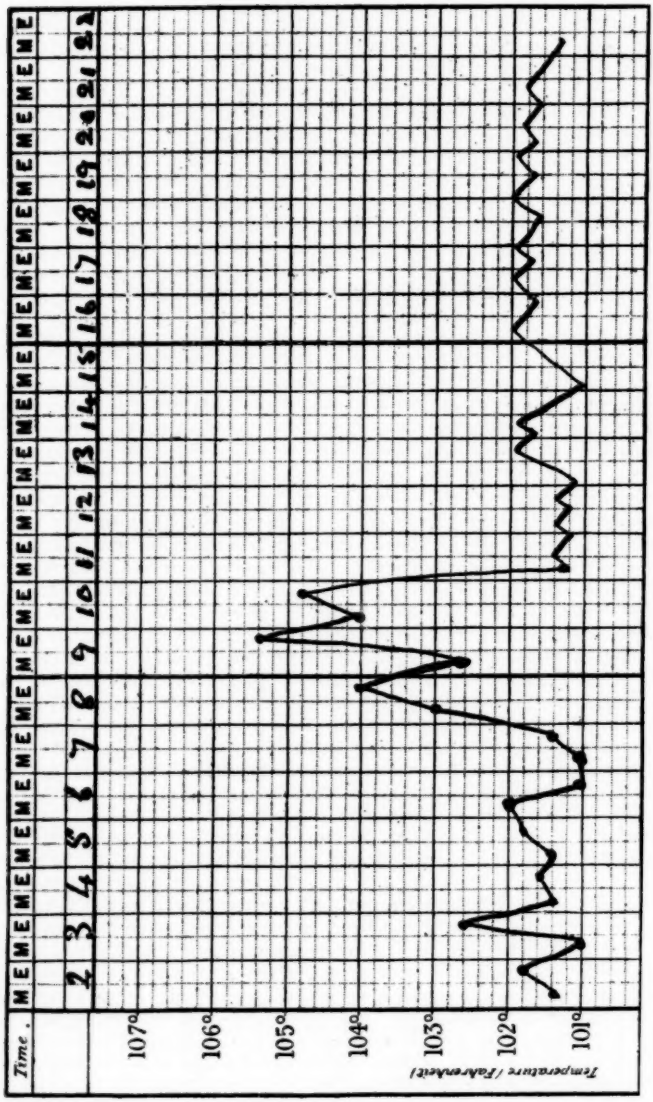
[1] Presented at the National Veterinary Association Meeting, 1908.

is not inoculable, for, so far as I am aware, all the published results up to date have been declared negative. Our results after inoculating the blood of cattle suffering from or recently recovered from English redwater make such a conclusion untenable, for although we have had some absolutely negative and some doubtful reactions, the majority of our results have been positive.

With regard to the reactions described as doubtful, I mean those which within the prescribed incubation period after inoculation showed a distinct febrile reaction, but in the blood of which no piroplasms could be found. The results obtained in heifer 49 and afterwards with her blood illustrate an indefinite reaction. Heifer 49 was inoculated with 5 cc. of blood obtained from an acute case in the field, and two days before the withdrawal of the blood used for inoculation piroplasms were numerously present in the red cells. Five days after inoculation, the temperature of heifer 49 rose 2° F., and remained above normal for three weeks, but no piroplasms were ever found in the blood in spite of daily examination. During the febrile reaction blood was withdrawn from heifer 49 and defibrinated. From 2 to 5 cc. of this blood were injected subcutaneously to six heifers. One of these, No. 54, had a temperature reaction commencing on the seventh day and lasting three days; the highest temperature recorded was 104·2° F. No piroplasms were found in the blood. The other five animals showed no reaction whatever.

That the failure on the part of these five heifers to react to the blood of heifer 49 was not due to any natural or acquired immunity is certain, because about a month later they all reacted more or less definitely to the blood of cow 2, another case of redwater contracted by natural infection in the field. It is also apparent that the said heifers acquired little or no immunity from the blood of heifer 49.

The following are the particulars of one of the said heifers:—Heifer 3, inoculated subcutaneously with 10 cc. of defibrinated blood from cow 2, a month after she (heifer 3) had failed to react to the blood of heifer 49. The temperature of heifer 3 rose to 102° on the sixth day, and fell to 101° on the seventh. On the eighth day it rose to 103° morning, 104° evening. Smears taken from the blood on the eighth day showed a small but distinct number of piroplasma bigeminum in the red cells. They were also present on the ninth day, but could not be found after this. The remainder of the reaction can be followed from the attached chart, by which it will be seen that the temperature became normal on the eleventh day, and remained so until the twenty-third day, when a second rise took place (102-103°), which lasted three days. This second rise of temperature after a normal interval is typical of the redwater reaction, and as in the case of the first febrile attack it may or may not be possible to demonstrate piroplasms in the red cells. Two fellow-heifers to heifer 3, numbers 1 and 4, gave a typical febrile reaction, 106° F., within the prescribed incubation period, followed by a second after the usual interval, but no piroplasms could be found in their blood by microscopical examination. If, however, one inoculates a series of animals with the blood of an animal suffering or recovered from redwater, and one finds that they all give a febrile reaction within a prescribed period, followed by a second febrile attack after a more or less constant interval, while in the red blood cells of the majority, as in my experience, one finds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Temperature (Fahrenheit)

REDWATER. HEIFER 3 inoculated with 10 cc. of blood from Cow 2 on September 1.

piroplasms, one is, I think, justified in concluding that the reaction was due to the virus in the animals in whose blood piroplasms could not be found by microscopical examination, as well as in those in which the blood parasites could be demonstrated. This means that what I have referred to as indefinite reactions to inoculation may be looked upon as positive, and that an animal may be suffering from a slight attack of redwater or piroplasmosis, although no piroplasms can be demonstrated in the blood cells by the ordinary method of examination. This, it will be seen later, has probably some bearing on infection of the ticks themselves, and on the transmission of redwater to cattle by means of ticks.

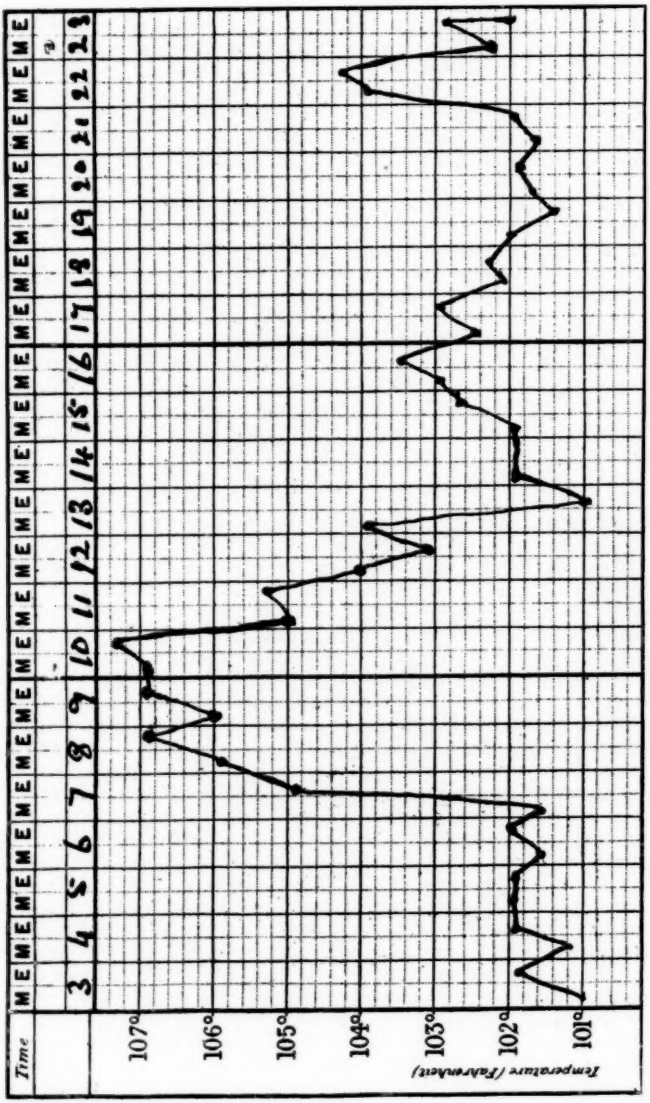
In order to further illustrate the reaction following upon the inoculation of blood from animals recently recovered from English redwater, it will be useful to examine the results obtained on heifer number 1b, which is one of another series of about twenty animals which have given a positive reaction accompanied by the presence of piroplasms in the red cells, and in addition the reaction in heifer 1b was associated with marked hæmoglobinuria which I have not found to be usual, but which still further convinces one regarding the nature of the disease inoculated. Heifer 1b was inoculated subcutaneously with 10 cc. of defibrinated blood from cow 2. This cow had recovered from an attack of naturally contracted redwater two months previously, but had had a severe relapse one month before her blood was used for heifer 1b. The temperature of heifer 1b rose to 105° F. on the fifth day after inoculation. It fluctuated between 105 and 107·2 for four days, and continued to be irregular for twenty days (see chart). Piroplasms were found in the red cells from the fifth to the tenth day after inoculation. Redwater was passed on the eighth and ninth days. The red cells fell about two millions below normal. The proof is furnished, then, that English redwater is inoculable.

Several animals, however, reacted to inoculation feebly, while others apparently did not react at all. Feeble reactions and failures to react are capable of explanation in one of the following ways: (1) The blood used may have been of low virulence. (2) Too small a dose of blood may have been used, which, in one sense at least, is another way of stating (1). (3) The animal operated on may have had a natural or acquired resistance.

We have experiments showing that one may succeed with a large quantity of blood after failing with a smaller one.

We have also experimental evidence showing that a virus which produced a feeble reaction in moderate quantity, 10 cc., caused a no more violent reaction when 100 cc. were injected. Far from being a distinction between English redwater and the Texas fever type of the disease, as one might possibly think from a perusal of general reports, it is really a point of analogy. My experience of South African redwater, however, as compared with English leads me to point out one difference which is not necessarily essential, and may be only one of degree, viz., that, whereas the difficulty in the former is to get recovered animals whose blood is of low enough virulence to make inoculation safe, it is comparatively difficult in the latter to get an animal whose blood is active enough to produce acute cases of redwater.

With regard to the third explanation of failure it is highly probable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that some individuals may be naturally more resistant than others to redwater, just as one finds in the case of other diseases, but resistance of this kind is usually easy to overcome. Animals, however, which have recently recovered from a natural or experimentally produced attack, or which may have been exposed to infection on the pastures possess a high degree of resistance, although it does not always amount to an absolute immunity. We have several times, for example, failed to infect animals under the above circumstances with comparatively large doses of very virulent blood which produced decided reactions in clean animals, and we have in some cases produced a mild attack in a recovered animal by re-inoculation.

The most resistant animals of all have been some which were bred on a redwater farm.

I think enough evidence has been brought forward to establish English redwater in the class of inoculable piroplasmoses. It still remains, however, to show that it is tick-borne, the proof of which has so far not been furnished in relation to British redwater. It is well known, of course, that animals sick of redwater will not infect others when tied up together in a stable, and yet the disease is inoculable. Such a condition of affairs of itself immediately suggests that it belongs to that class of disease which requires an intermediary carrier.

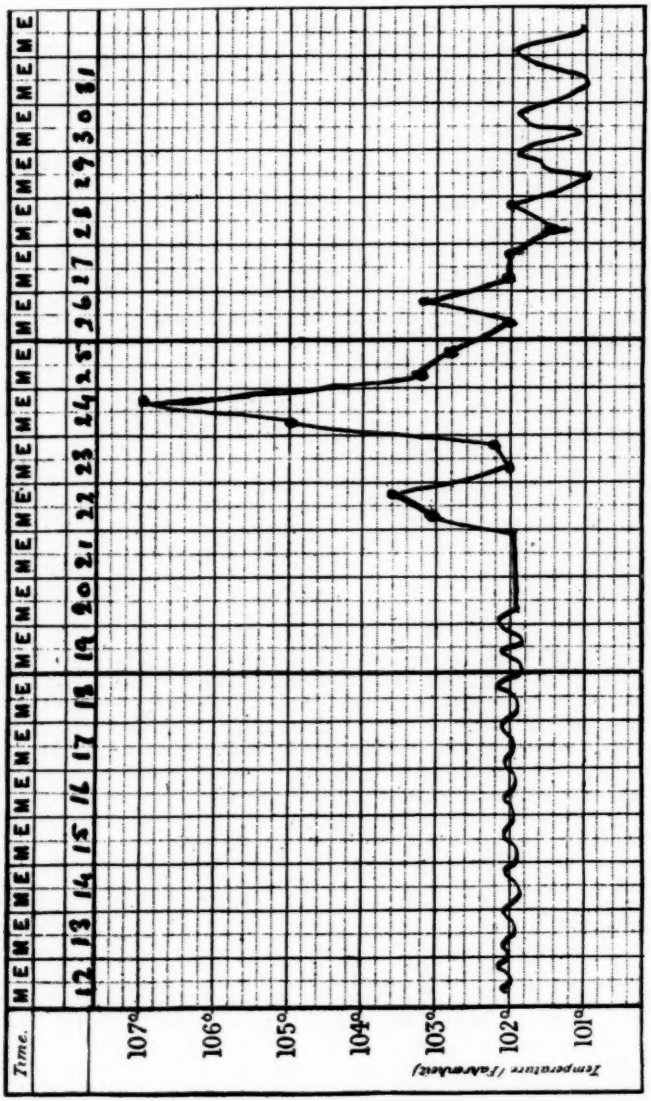
A difficulty presents itself when one goes into the field to obtain ticks, for one finds on studying the life history of those present on cattle and sheep that they all belong to the varieties which require three separate hosts for their development, and pass through two moults away from their annual hosts before becoming fully matured. The disease in America, Australia, Africa, and Southern Europe is carried by varieties of ticks which go on to the cattle as larvæ, and the females only leave when they are fully engorged adults. This variety is easy to work with, and it is the progeny of the mothers which have sucked on sick or recovered cattle which carry the disease to other animals; that is to say, infection passes through the tick egg. The three-sucking varieties, on the other hand, require considerable experience and attention to get them through their various stages for experimental purposes, and the losses among them are very great.

In England I have met with only two varieties on cattle and sheep, the *Ixodes ricinus*, and the *Hæmaphysalis punctata*, both of which are three-suckers, and so far as I am aware no tick requiring only a single host has been found on these animals

In common with the experience of others the former variety has been found most often to be present on redwater pastures. I do not know if the latter has been observed in Scotland and Ireland, but although its distribution in England is much more restricted than that of the former, I have obtained it from redwater farms upon which the *I. ricinus* could not be found.

With the *I. ricinus* our experiments have been few, and at present it need only be said that they have failed up to date to show that infection passes through the eggs to the young ticks.

With the *H. punctata* the experiments have been more numerous, and it seems probable in view of the similarity in the life history of the two varieties that what occurs with the one will hold good for the other. In testing whether a three-sucking tick is a carrier of disease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or not, one must experiment with it in each of its stages, for it has the chance of infecting itself on a suitable animal under three different conditions: (*a*) By sucking as a larvæ it might after moulting give the disease to the host upon which it sucks as a nympha; (*b*) By sucking as a nympha it might after moulting give the disease as an adult; (*c*) By sucking as an adult it might pass the infection through the eggs to the larvæ, which would then be infected.

The ticks used for these experiments were all bred from females matured on sheep, so that there can be no question of their having been infected in the field.

Experiments to Test Nymphæ of Punctata which had Sucked as Larvæ.

(1) A number of larvæ were fed on cow 2. Cow 2 at the time was about a month recovered from English redwater, and her blood was proved to be infective by inoculation.

The larvæ dropped off and moulted to nymphæ in about three weeks, and twelve days later about fifty nymphs were placed on heifer 50. The nymphs engorged, and dropped off in the usual time. The result was negative.

(2) Larvæ were fed on heifer 124 while she was showing a small number of piroplasms in her blood. They dropped off engorged in the usual time, and moulted to nymphæ after about a month. On heifer 48 were placed 350 of the above namphæ; no reaction ensued, and no piroplasms could be found during eleven days, when another 300 nymphæ were put on. She was kept under observation for five months. The result was negative.

(3) On heifer 170 were placed about 150 nymphs which had fed on heifer 123 when she was showing piroplasms in her blood. The result was negative.

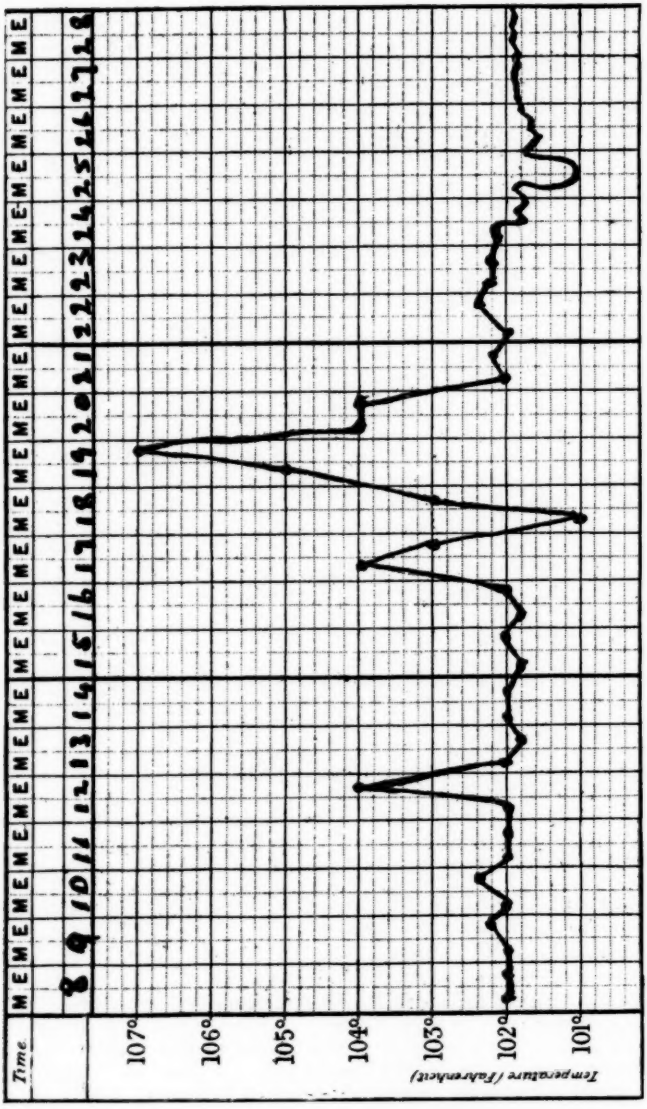
(4) On heifer 168 were placed 200 nymphs fed as larvæ on heifer 123 when she was showing piroplasms in her blood. They were put on nine months after sucking and six months after moulting. They attached themselves in the usual way and filled up. The result was negative.

I am not prepared to assert from the above experiments that nymphæ which have fed as larvæ on a sick animal never convey the disease, but it seems likely that they do not do so readily, and it may be here pointed out that the amount of blood taken up by larvæ is comparatively very small. It is also possible that the piroplasms do not develop inside the organs of the larvæ.

Experiments to Test Adults of Punctata which had Fed as Nymphæ.

(1) Nymphæ of *H. punctata* were fed on cow 2 (English redwater) when her blood was found to be infective by inoculation. They engorged, and moulted in about a month, and were almost immediately placed on heifer 42. Her temperature rose to 103° F. on the tenth day, and to 105° morning, 170° evening on the twelfth day. A few piroplasms were found in the blood, but not until the fourteenth day. The result was positive in this case.

(2) A month after moulting twenty-four of the same batch of ticks used in the above experiment were placed on heifer 6a. Her tempera-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Temperature (Fahrenheit)

REDWATER. HEIFER 6a. Adult ticks (punctata) which had been infected on Cow 2 put on this Heifer November 8.

ture rose to 104° F. on the fifth day. One pair of piroplasms was found on the ninth day—temperature 104°. On the eleventh day, the temperature was 105° morning, 107° evening; the piroplasms were distinctly numerous, and they could be found up to the sixteenth day.

EXPERIMENT TO TEST PUNCTATA LARVÆ FROM MOTHERS WHICH HAD FED ON INFECTED ANIMALS.

Adult punctata were placed on cow 2 when her blood was known to be infective. They came off engorged in the usual time, but as the season was late, they did not lay until the late spring of the next year, and the larvæ did not hatch out until ten months after their mothers had engorged. On heifer 125 were placed 200 of these larvæ. The heifer was kept under observation for three months, but the result was negative.

TREATMENT.

With regard to treatment there is little that I can say, and I prefer to leave this part of the subject to those who are going to continue the discussion. Ten of our cases of English redwater have required no more than careful nursing to prevent a fatal termination. Of course, it must be recognized that after a severe attack the consequent anæmia must be treated, but it is seldom rebellious.

It is frequently asserted that one must fear abortion as a complication of redwater, but none of our pregnant animals have aborted during an attack. We have observed, however, that œstrum is often delayed, and that when it does come on, the female generally returns once or oftener to the bull. I have also seen the sexual power of bulls materially weakened by an attack.

PREVENTION.

I wish only to speak in general terms on this part of the subject, as it is intimately bound up with the life-history of the ticks, and that alone would form material for a very considerable paper.

There are three methods under the head of prevention, which one may attempt to carry out.

(1) By inoculating with virulent blood all new animals before going on to the infected pastures, and nursing them, if necessary, through the attack, one may give them a degree of immunity to start with which will prevent them suffering severely from the infection conveyed by the ticks. The infected ticks themselves will keep up the degree of immunity so long as the animals are on the pastures. It is equally applicable to the above class of animal and to those bred on infected farms, that their resistance to redwater requires to be renewed by inoculation if they have been off the pastures for a time, during the winter for example.

It should be realized that by accepting the inoculation method one increases the animal's potentiality of infecting ticks, and one also make's up one's mind to accept the disease as a permanency. It should also be recognized, that so far as we know at present, the so-called immunity is not really an immunity, but is to be looked upon rather as a tolerance which depends for its continuation on the upkeep of the virus in the body. There is always a risk then of this tolerance due to latent infection breaking down under the stress of

other maladies which may attack the animal, difficult parturition for example.

(2) One may attempt to eradicate the ticks from the pastures and so dispose of the natural carriers, the only agents which convey the disease naturally. One attempts to get rid of ticks by fully stocking the pastures, and periodically dipping or spraying their hosts. The ticks under discussion, however, remain at each stage for a comparatively short time, three to ten days, on their hosts, so that the chances of catching a large number at each dipping is not great, unless the bath or spray be resorted to at impossibly short intervals. There is no doubt, however, that by keeping up periodical dipping for some years one makes an impression on the number of ticks, but one cannot hope to completely eradicate them, as cattle and sheep are not their only hosts.

It will be gathered from the tick experiments that the seasons at which the adults are most numerous, should be those at which redwater is most prevalent. From observations on ticks bred in the laboratory, and hurried, as it were, through their life periods, these seasons ought to be March to June, and October to November; possibly when a searching inquiry is made into things as they occur in the field and under more natural conditions, the periods of greatest prevalence may turn out to be somewhat different.

The most important periods for dipping or spraying are when the adult females are on the animals, not because the operations will at first diminish the number of cases of redwater, for the ticks will already have inoculated their virus, but because the greatest benefit is to be expected by killing the adult females before they can lay their eggs for the upkeep of their species. The ticks in question remain for a longer time on their hosts when in the adult stage (ten days or more), and this is a further reason for pushing the dipping or spraying at this time.

The most useful agent for the destruction of ticks is an arsenical solution or a paraffin emulsion. The effects of dips, however, are not very reliable, and no dip will keep ticks off for an appreciable time.

(3) One may leave the ticks to purify themselves by keeping cattle off the pastures.

Judging from the life history of the ticks under discussion, and that of a similar variety with which I had the opportunity of experimenting in Africa, I think the period required would be about fourteen months. One could hasten the process, however, and at the same time utilize the pastures by fully stocking them with them with sheep, as these animals do not, of course, infect the ticks.

In attempting to deal with redwater in the preventive sense, it will no doubt be found that one of these three methods of prevention is more applicable to this or that district. Inoculation, I think, should be the last resource. A combination of (2) and (3) promises the greatest approach to finality, that is to say, cattle should be kept off infected pastures, which should be well stocked with sheep, and the sheep should be dipped at intervals of ten days, particularly in the season when adult ticks are in evidence.

We are indebted to the National Veterinary Association for the loan of the charts illustrating this article.

THE SYMPTOMS AND DIAGNOSIS OF TUBERCULOSIS.

BY DR. L. VAN ES, EXPERIMENTAL STATION, NORTH DAKOTA.

IT is only in a small percentage of the cases of bovine tuberculosis that the symptoms are sufficiently plain and characteristic to permit of a correct diagnosis. In fact, there are many cases in which the disease has involved certain organs to a considerable extent, and in which symptoms are either obscure or entirely wanting.

It was this lack of diagnostic symptoms, which, until the discovery of a specific means of diagnosis, so seriously interfered with the development of the rational means of prevention. It is also this lack of symptoms which is responsible for the serious spread of the disease in herds before even its presence is suspected.

The most prominent feature of tuberculosis is its slow and insidious development, although acute exacerbations are occasionally seen during its course.

When symptoms are present, they are associated with the organs or set of organs in which the lesions are found.

In tuberculosis of the lungs, no symptoms which may lead to the suspicion of the presence of the disease, may make their appearance for a long time. One of the first signs to be noticed is a dry, hacking, short cough. This cough is especially produced when the animals leave a warm stable, and suddenly breathe in the cold air of the outside, or after the first swallows of food or drink, upon exercise, or when the stable atmosphere is contaminated with dust or certain irritating stable gases. It may also be seen that the animals are short of breath, at first only when caused to move about, but later also when at rest.

When the disease develops and more lung tissue becomes involved, the cough increases in frequency and in force, while the respiration becomes hurried and short, and in many cases assumes an abdominal type.

In quite a number of cases, the general condition of the body becomes less thrifty; the animals do not do well, and do not seem to make the gain which they formerly made on the same amount of feed; in fact, in the case of milk cows a loss in weight is experienced, and the animals become poor. The appetite becomes capricious, or fails altogether. The coat is dull and staring, while the skin presents the condition so well defined under the term of "hidebound." With the progressive emaciation, the mucous membranes become pale, the eyes are sunken and of a dull appearance.

In the last stage of pulmonary tuberculosis the wasting of the tissues of the body is extreme; the fatty tissues have disappeared, and the muscles of the body and limbs have undergone a great reduction in size. The animals stand with the head extended, and the elbows turned outward. Respiration is now difficult, especially when the animal is caused to move about. The cough, while still frequent now becomes weak, painful, and may be accompanied by a muco purulent yellowish, lumpy discharge from the respiratory organs. The mouth is kept open and the tongue protrudes.

Before the disease of the lungs has so far advanced as to give rise to the symptoms mentioned, other organs like the thoracic lymphnodes, or the digestive organs, often become involved, and give rise to complications, as shown by circulatory or digestive disturbances.

The body temperature may remain normal for quite a while after the disease has gained a foothold in the lungs. Occasionally, however, there may be flushes of fever, which persist for a day or two. When the disease makes headway, fever is more frequent, and is especially characterized by an evening rise, which rarely reaches beyond 105° F., and returns again to the normal by the following morning. In the older cases the evening temperature may reach 106° F. in some animals, while in others fever is more erratic, and after persisting for a few days the temperature may again become normal.

The results of auscultation and percussion in pulmonary tuberculosis are variable or indefinite. Sometimes the respiratory murmur is increased, in other cases, decreased or absent, while in many cases the physical signs of bronchitis are present. The percussion sound only shows a deviation from the normal, when tuberculous deposits of considerable size are situated close to the surface. In such cases more or less dulness may be present.

Tuberculosis of the lungs may or may not have associated with it disease of the air passages and the larynx. In such cases the symptoms are merely those of a catarrhal nature such as may be met with in other conditions. Only in considerable involvement of the larynx, certain symptoms may lead to the suspicion of tuberculosis. Those are a spasmodic and painful cough, tenderness about the parts, and a roaring or snoring sound during respiration, while they may be accompanied by a difficulty in swallowing.

Involvement of the pleura is a frequent complication of pulmonary tuberculosis, but may also occur independently of the latter. Its symptoms are usually very obscure. There often is a cough, while frequently the animals seem to be tender upon pressure upon the chest. Striking the chest may cause the animals to cough, while in occasional cases friction sounds may be noticed while applying the ear to the animal's side.

The symptoms of tuberculosis of the digestive organs are even more obscure than those of the respiratory ones, unless the lesions are situated in the mouth, where they can be plainly seen. When the intestines are diseased, there occur disturbances of digestion, such as alternating constipation and diarrhœa, periodic attacks of colic and bloating, absence of appetite, while most of the symptoms may be accompanied by the emaciation so commonly seen in the other forms of the disease.

Tuberculosis of the udder may be suspected when the organ presents a painless, dense, ill-defined enlargement of one of the hind-quarters, which gradually extends to the other parts of the udder, and finally assumes the features of a large, very hard and nodular mass. In other cases multiple areas of nodular formation may be felt in the soft udder tissue, and which gradually increase in size and extent, until a considerable portion of the udder is transformed into a hard mass with a nodular surface. The lymphnode situated on the upper part of the hind-quarter may be enlarged and nodular in condition, a fact which should always add to the suspicion of tuberculosis.

The genital organs of the male are but rarely diseased. When tuberculosis is present in the testicle, those organs are more or less indurated, and have a nodular appearance. On the penis the disease may manifest itself by the presence of small hard nodules and superficial ulcerations.

In the female, the reproductive organs are more frequently the seat of tuberculosis. When the lesions are situated in the uterus, the only symptoms noticed may be a chronic purulent discharge from the vulva in which cheesy lumps or blood streaks may be observed. Rectal examination reveals the fact that the organs are enlarged, and very dense to the touch. Cows so affected do not get with calf, while during the earlier stages of the disease they may remain continually in heat.

The infection of the lymphnodes, which occurs with great regularity in all cases of tuberculosis, may occasionally be accompanied by appreciable symptoms.

The superficial nodes, when they contain lesions, are enlarged, hard, usually movable, and slightly tender to the touch. In some cases, like tuberculosis of the lymphnodes of the pharnyx, considerable swelling of the parts may be observed. The enlargement of those organs may cause them to interfere with the functions of other organs or structures as a result of pressure.

Tuberculosis of the deeper lymphnodes is not manifested by any symptoms unless their great size causes them to encroach upon the other organs. This is seen in the disturbances produced by the pressure of the mediastinal lymphnodes upon the large blood-vessels of the chest, or upon the gullet. In the former, the circulation of the blood is interfered with, while in the latter, the animals have difficulty in swallowing and in rumination, and bloat up quite frequently owing to the impediment to the normal escape of the gases from the stomach.

Reviewing the various symptoms mentioned, it may be seen that while there is no lacking of evidence that the disease is present, their nature is not always such that a definite conclusion is possible, as similar symptoms are met with in a great variety of other abnormal conditions.

In order to definitely diagnose the disease, we cannot always depend upon the symptoms, and have to employ other and more accurate methods.

The Diagnosis of the Disease.

While certain symptoms, such as persistent cough, a general unthrifty condition or emaciation, a "hidebound" appearance, the constant "bulling" of cows, shortness of breath, and enlargements of certain superficial lymphnodes, may justify the diagnosis of tuberculosis, they often do not become evident until after the disease has made some advance, and are, therefore, not available at the time, when a correct diagnosis is of the most practical value, that is in the very beginning of the disease. A reliable diagnosis at that time enables us to eliminate an infected animal from the herd, before other animals can contract the disease from the one already affected.

This difficulty in the diagnosis practically has been overcome, as a result of an achievement of modern science, namely, the discovery of the bacillus tuberculosis by Robert Koch, of Germany. Not only are we now able to find this organism in certain discharges or tissues from diseased animals and thus assure our diagnosis, but by the use of certain substances produced by this germ, when grown upon artificial

media, we can bring forth certain reactions in a tuberculous animal, which constitute unmistakable evidence of the disease.

While the finding of the specific bacillus is a valuable aid in the diagnosis, it has not the general practical usefulness of the application of the product mentioned in the preceding paragraph, and which is known under the name of tuberculin.

Tuberculin.

This substance was prepared by Robert Koch in 1890, and was at first considered as a remedy against the disease. In consists of a sterile extract of cultures of the tubercle bacillus, and is prepared as follows: The bacillus is cultivated upon a bouillon, containing 1 per cent. of peptone and 5 per cent. of glycerine, for eight to ten weeks at body temperature. The culture is then evaporated to one-tenth of its original volume, sterilized, and filtered. This liquid thus obtained constitutes the concentrated tuberculin, and presents itself as a brown, syrupy, limpid, and clear fluid, having the pleasant, flowery odour characteristic of cultures of the bacillus tuberculosis.

When tuberculin is injected under the skin of tuberculous animals, it produces certain changes about the lesions, and this reaction led its discoverer to believe that a specific remedy against the disease had been found. The use of tuberculin in practice, however, soon proved this view to be erroneous, although it cannot be denied that it had in many cases a beneficial influence upon the course of the disease. While its application in different cases of tuberculosis led to varying results, it was found that one phenomenon presented itself with great regularity in nearly all, and that was the peculiar behaviour of the body temperature some time after the liquid was injected.

Numerous experiments showed that this reaction not only took place in man, but also in tuberculous animals, and as in the latter the rise in temparature was not accompanied by bad effects, tuberculin soon came into use as a diagnostic agent, and especially so in relation to bovine tuberculosis.

The results obtained in this connection cannot be better expressed than by quoting the conclusions formulated by Nocard:—

(1) "Tuberculin produces in tuberculous bovines an incontestable, specific effect, especially shown by a marked elevation of temperature.

(2) "The injection of a large dose ordinarily provokes in tuberculous animals an elevation of temperature ranging between 2·7 and 5·4° F.

(3) "The same dose injected into non-tuberculous bovines does not provoke any appreciable febrile reaction.

(4) "The febrile reaction appears most frequently between the twelfth and fifteenth hours after injection, sometimes after the ninth, very rarely after the eighteenth hour; it always lasts several hours.

(5) "The duration and the intensity of the reaction bear no relation to the number and severity of the lesions. It seems even that the reaction is most marked in cases in which, the lesion being of a very limited character, the animal has maintained the appearance of good health.

(6) "In subjects which are very tuberculous, consumptives in the proper sense of the word, and especially in those which are feverish the reaction may be a weak one, or may even fail to appear."

The Tuberculin Test.

The application of tuberculin for the purpose of detecting tuberculosis is known as the tuberculin test, and consists of the following procedures:—

(1) *The Recording of Body Temperature prior to the Injection of the Tuberculin, in order to Note the Temperature under Ordinary Conditions.*—This may be done by taking the rectal temperature by means of a common clinical thermometer in the morning and evening of two days, or at every two hours during one day. Care must be taken when the temperature is taken that the animals are quiet, free of excitement, and not exposed to the excessive heat of the sun during summer days, nor is it advisable to allow them to drink cold water for one hour previous. In animals having a temperature 103°, it is advisable to postpone the test until the fever has disappeared.

(2) *The Injection of the Tuberculin.*—This is preferably done late in the evening, when the last temperature was taken. The injection is made by means of a hypodermic syringe, selecting either the side of the neck or the chest back of the shoulder as the point of injection, as at those places the skin is thin and loose.

In order to avoid possible infection by means of the hypodermic needle, it is a good practice to previously wash the parts with some antiseptic solution, and to have the syringe and needle sterilized by boiling water.

While any hypodermic syringe will answer the purpose, a modern all-metal syringe is to be preferred, as it can be more readily sterilized, and is far less liable to get out of order.

The tuberculin used in the test is usually furnished in two forms—concentrated or diluted. The latter is ready for use, while the former has to be diluted according to the directions given by the laboratory where it was prepared.

(3) *The Recording of the Temperature after Injection.*—This is done in the same manner, and with the same precautions, as before the tuberculin injection. It is best to begin taking the temperature ten hours after injection, and to continue to do so every two hours until it has been taken five or six times.

(4) *The Interpretation of the Temperature Records.*—This is done by carefully comparing those obtained before and after injection.

When tuberculin is injected into an animal free from tuberculous lesions, there will usually be no difference in the height of the temperature recorded before or after injection, and in the few cases where there is a difference this is only slight. In fact, in such animals the tuberculin injection does not produce any disturbance in the functions of the body.

The thermic reaction indicating the presence of tuberculous lesions consists of a rise of temperature after the injection of tuberculin. This rise usually begins six to ten hours after the injection, and gradually reaches its greatest elevation from the twelfth to the twentieth hour, after which it declines to the normal temperature, which is reached in from twenty-four to forty hours. In a number of the cases in which the reaction is well marked, it may be accompanied by dulness, loss of appetite, or a reduction in the flow of milk. Like the rise in temperature, however, those disturbances are transitory in character, and do not in any way impair the general health of the reacting animals.

What reaction should be present in order for us to safely diagnose tuberculosis? In consulting the literature on this question, we find that reactions are variously interpreted. Nocard regards a reaction as positive when the elevation in temperature amounts to 2·7° F., while one amounting to from 1·4° to 2·5° F. should place the animal in the suspected class to be held for a second test. Hutyra and Marek regard as tuberculous any bovine of more than six months old: (*a*) when its body temperature, as compared with the highest temperature recorded before the injection, is raised 2·7° F. or more, or amounts to 104° F. after a rise of not less than 0·9° F.; (*b*) when its temperature is 1·8° to 2·5° F. higher, or amounts to more than 103·1° F., and at the same time is accompanied by organic disturbances.

On the contrary, there is no ground for the diagnosis of tuberculosis when the temperature has not increased more than 2·5° without exceeding 103·1° F., and is not accompanied by an organic disturbance, provided that a systematic examination of the animal concerned does not reveal pathologic changes which may warrant the suspicion of tuberculosis. In calves below the age of 6 months, only a rise of temperature above 104·9° F. should be regarded as a positive tuberculin reaction. Ebar, as quoted by Salmon, formulates as follows:—

(*a*) For young cattle up to 6 months old. With young cattle up to 6 months old, if the temperature before the tuberculin injection is not found to exceed 104° F., all rises in temperature above 104° F. are to be looked upon as reactions, provided that the difference between the highest temperature observed before the injection and the highest temperature observed after is at least 0·9° F.

(*b*) For cattle more than 6 months old:—

(1) Only such cattle are to be submitted to the tuberculin test as have a temperature not exceeding 103·1° F. at the time of the injection.

(2) A rise of temperature to 103·1° F. after the tuberculin injection is not in any case to be regarded as suspicious.

(3) With all cattle having temperatures not exceeding 103·1° F. at the time of the tuberculin injection, every rise above 104° F. is to be regarded as a reaction.

(4) Further, all rises of temperature above 103·1° to 104° F. are to be considered reactions, when the total rise compared with the temperature before the injection is at least 1·8° F.

(5) All rises of temperature above 103·1° to 104° F., when the total rise, compared with the temperature before the injection, is less than 1·8° F. should be regarded as doubtful, and the case judged on its merits.

The decision as to which of these cases are to be considered as reactions, and which as non-suspicious, is to be made according to the nature of the case. It has been found by experience that important aids to forming a decision are furnished by the total increase compared with the temperature before injection, which, with reacting animals, as a rule, should be 0·9° F. at least, by the character of the temperature curve, and by an exact clinical examination, the necessity for which, in doubtful cases, is again emphasized.

(6) For all those cases in which the tuberculin test is simply to serve as a means of ascertaining the dissemination of tuberculosis in a stock of cattle, with the object of separating the suspected animals from those which are not suspected, so as to carry on the suppression

of tuberculosis, it is sufficient, according to Ostertag, to regard all those cattle as suspected the interior body temperature of which exceeds 103·1° F. after injection of the prescribed quantity of tuberculin, that being an increase of at least 0·9° F. above the highest temperature observed before injection.

From the above it appears that there is a margin between the temperature record denoting absolute absence of reaction and the one indicating a positive reaction, where it is difficult to interpret the results of the test. Practical experience with the tuberculin test, however, shows us that the number of cases on this border line is slight, as most animals show temperature records permitting a prompt interpretation. It is, therefore, perhaps safest to defer the interpretation of the test in such cases by placing the animals in the doubtful class until a second test can be made, unless a positive diagnosis can be based upon clinical or bacteriologic evidence.

A typical positive reaction shows the presence of tuberculosis with a high degree of certainty. In the small number of cases in which *post-mortem* examination fails to confirm the tuberculin diagnosis, this apparent error must be attributed to the extreme sensitiveness of the re-agent, which denotes lesions so minute that they escape attention during the most careful autopsy.

A small tubercle, perhaps not larger than a pin-head, concealed in the depth of a large organ or in a remote lymph node, will produce just as pronounced a reaction as more extensive lesions. The tuberculin reaction, namely, does not in any way indicate the extent of tuberculous lesions, in fact, we often find the most marked rise in temperature in cases having but slight and recent lesions.

If the tuberculin test leads to errors in diagnosis at all, they are not found in connection with the reacting animals, but among infected cattle which failed to do so. It has been found that certain animals in an advanced stage of tuberculosis no longer react to the test. This source of error, however, is slight, as the animals which are diseased to the extent of no longer responding to tuberculin, usually present symptoms by which tuberculosis may be diagnosed or at least suspected. For the sake of thoroughness, however, it is wise to submit the non-reacting members of a tuberculous herd to a careful clinical examination, so that animals showing symptoms leading to the suspicion of tuberculosis may be properly dealt with.

Another source of error is based upon the fact that certain animals once injected with tuberculin, temporarily become insensible to subsequent injections. Nocard found that of twenty-four reacting cows only 33 per cent. reacted when the test was repeated in twenty-four hours; 50 per cent. reacted when the second test was made eight days after the first one; 60 per cent. reacted after two weeks; and all reacted again after one month.

The peculiarity just mentioned is sometimes taken advantage of by unscrupulous dealers who inject tuberculous animals with tuberculin, so that they may be sold as sound or subject to the tuberculin test. Vallee, however, found that animals so prepared reacted upon a double dose of tuberculin in thirty-six to forty-eight hours after the last injection, but that the reaction began much earlier and lasted for a shorter period. In such cases, it is necessary to begin taking temperatures two hours after injection.

Prognosis.

While as a whole the prognosis of bovine tuberculosis is decidedly unfavourable, there are circumstances under which the disease makes very slow progress as may even be eliminated. The circumstances referred to are especially the keeping of animals in the fresh open air and an abundance of good, nutritious food, while it is only in the initial stages of the disease that such a favourable termination occasionally will occur.

When the disease has made some headway, when good, sanitary surroundings are not available, and especially when the animal is exposed to repeated infection by being with other infected animals, it will ultimately lead to the various conditions referred to in another chapter.

In view of the unfavourable prognosis it seems advisable when dealing with tuberculous animals, at least such as are not especially valuable for breeding purposes, to submit them to slaughter, while the disease is yet of such a character as to permit the meat to be used as human food.

Treatment.

At the present time no specific treatments for cattle tuberculosis can be recommended. It is true that certain authors have witnessed a beneficial effect of certain agents, but their application in cattle is either too expensive or impracticable. It is possible that some specific treatment may be worked out, and in this connection it will be interesting to watch what results will be obtained with von Behring's "tulase," the effect of which is now being studied in human patients in some of the clinics of the European continent.

Economic Importance.

A disease as widely spread as tuberculosis cannot fail to cause serious losses to our animal industry. Owing to the lack of reliable statistics, however, it is impossible to express the amount of those losses in dollars and cents.

In dairy herds, which harbour the disease, it sooner or later will lead to a notable decrease in the production of milk; under its influence abortions often occur, while many cows ultimately succumb to it.

Among pure-bred stock the occurrence of tuberculosis is not less serious. Here we find animals which represent the life-long effort and application of skill of their breeders, if not of generations of breeders. In many cases the value of such animals runs into the thousands, and as certain blood strains are often represented by the comparative few animals in one herd, it is needless to say that tuberculosis, either through death of animals or even by interfering with their reproductive functions constitutes a formidable enemy to animal husbandry.

Many a breeding farm can testify to the cost of having tuberculosis introduced into its herd, and many a breeder has seen his prosperity diminished or destroyed by this veritable scourge.

In addition to the losses produced in the original herd of thoroughbred cattle, there is a dissemination of the disease into other herds by the sale of young breeding stock. The writer knows of several

instances in which North Dakota farmers introduced the disease into their herds by buying new animals to improve their stock, without taking the necessary precautions in regard to tuberculosis.[1]

POISONING OF STOCK WITH ARSENIC.

BY L. E. W. BEVAN, M.R.C.V.S., GOVERNMENT VETERINARY SURGEON, SALISBURY, RHODESIA.

DURING the past year a great many cases of poisoning with arsenic have occurred among stock in Rhodesia. In this country, but recently recovered from the ravages of African Coast fever, sudden outbreaks of sickness are always received with alarm by stockowners, and are promptly notified to the officials of the Veterinary Department, who have thus been enabled to gain not a little practical experience of the toxic effects of this drug.

The form of arsenic chiefly responsible for these fatalities has been the arsenite of soda, supplied in large quantities by the Government for the eradication of locusts. Dissolved in water and mixed with a strong solution of brown sugar, this dangerous and very soluble salt of arsenic is sprayed upon the swarms of young hopping locusts whose wings have not yet developed. The work of spraying is left to farmers, policemen, and often to natives, who, having little idea of the dangerous nature of the material, handle it in a most careless manner. Their most common error has been to throw away haphazard the coarser pieces of arsenic which have not dissolved, and have accumulated at the bottom of the bucket or "drum," and are too large to pass through the spray-pump.

Cattle grazing over a sprayed area are loath to leave it on account of the sweet, or it may be, the brackish taste of the solution, and it generally happens that some of the herd chance upon the larger undissolved particles which they greedily swallow. It is even possible that the solution itself is capable of producing toxic effects if taken in sufficient quantities. That it is very dangerous, even in comparatively small doses, is shown by the death of a number of goats which had merely licked the bed-planks of a waggon upon which arsenite of soda had been loaded and spilt, and become dissolved by the rain.

Another frequent source of poisoning is the careless dipping or spraying of cattle in arsenic-containing dips. Cattle arriving at the dipping tank thirsty, and not having been previously watered, are liable to drink the poisonous solution.

Occasionally a nervous or sulky animal will not swim through the tank, and remains in too long; and, again, cattle greedy for salt are apt to lick each other when wet with the dip. To avoid these accidents it is usual to add a quantity of aloes to render the dip unpalatable.

Deaths have not unfrequently occurred from spraying cattle with solutions containing too great a proportion of arsenic. This accident is most likely to occur with colourless dips or those having a muddy appearance, where the operator, thinking the mixture too weak, is tempted to add more. In these cases, and in those resulting from

[1] Bulletin 77, North Dakota Government Experiment Station.

animals remaining in the tank too long, it is probable that poisoning results from absorption through the skin.

Symptoms.—In the last class of cases, if the animal does not die with acute symptoms within a few hours, the skin appears scalded, especially in those parts where it is thinnest, and where it is less thickly covered with hair. Later, the skin sloughs in greater or lesser patches, especially around the eyes, in the groins, over the scrotum of the bull and udder and vulva of the cow. Cattle so scalded walk only with the greatest pain, their gait varying according to the position of the cutaneous lesions. These symptoms are frequently accompanied by general symptoms, due to absorption of the poison.

Where the drug has been swallowed the symptoms seem to depend upon the quantity and the form in which it was taken. Thus a very strong solution of a readily absorbed form of arsenic produces most acute symptoms, but solid and compact pieces of arsenic, not easily dissolved, or preparations of the drug not readily absorbed, give rise to less acute symptoms, and a slower form of poisoning.

A very usual feature of the acute form of poisoning is that the animals are generally found dead in or around water. This may be because they suffer from intense thirst; but the evidence seems to suggest that arsenic can remain in the rumen undissolved or unabsorbed without giving rise to serious symptoms. The drinking of water not only dissolves but sweeps the solution on to other compartments of the stomach—especially the abomasum—and to the intestines, where it is rapidly, almost instantaneously, absorbed. Animals which die from this acute form succumb with alarming rapidity, and often are never noticed to be sick.

In less acute cases where the poison is not so readily absorbed, or is absorbed in smaller quantities, the first symptoms arise from local inflammation of the gastro-intestinal tract. Diarrhœa, terminating in dysentery, severe abdominal pains, progressively increasing emaciation and weakness, paralysis of the hind-quarters, and subnormal temperature are the chief features.

The two principal *post-mortem* lesions, of the greatest diagnostic value, are the stiffness of the skin and the absence of putrefaction. The skin quickly becomes hard, and when pinched between the thumb and fingers remains in a fold. The absence of putrefaction for any length of time, and the fact that gases are not formed as the result of decomposition in the rumen and intestines, are remarkable features in a sub-tropical climate, where these changes generally set in almost immediately after death.

Other *post-mortem* lesions are not well marked, and it would appear that the poison, taken rapidly into the circulation, depresses or paralyses the heart. It is probable that it also has a marked effect upon the blood-vessels, which appear congested and dilated. The ramification of the small vessels of the peritoneum are exceptionally well defined, so that the omentum has an almost characteristic appearance. Possibly, however, the cause of death is of nervous origin.

In these acute cases fatty degeneration of the various organs is not met with, but the liver and kidney appear intensely congested.

In those cases where death has not occurred so rapidly, in addition to the stiffness of the skin and absence of putrefaction, severe lesions

of the gastro-intestinal tract are generally present. While the lining membranes of the rumen, reticulum and omasum readily peel off exposing a highly injected submucous layer, the more severe lesions are encountered in the abomasum. In most cases the true stomach is most intensely inflamed and blood-stained, and not uncommonly contains a quantity of blood-stained fluid and blood clot. The whole of the intestines are also inflamed. Often a quantity of blood-stained fluid is met with in the peritoneal cavity.

When the animal has lived as long as four or five days the carcase has become very emaciated from the continual purging; and where death has been delayed even longer than this, fatty degeneration of the liver and kidneys is met with to a greater or lesser extent.

The question often arises, "How much arsenic is required to kill an ox?" Most authorities agree that the horse and ox are proportionately less susceptible to the poisonous effect of arsenic than man and some of the lower animals. Experience would indicate that much depends upon the form of the drug, the readiness with which it is dissolved and absorbed.

Little can be said about antidotal treatment. Such refinements as *ferri oxidum hydratum cum magnesia*, dialysed iron precipitated with an alkali, &c., are not commonly available on the veldt or at pioneer homesteads. Castor and linseed oil can sometimes be obtained and demulcents can generally be concocted. These sometimes assist Nature in effecting a cure, but it must be admitted that recoveries are "few and far between." The Rhodesian farmer, however, is not ungrateful to the veterinary surgeon who can satisfy him that his cattle are not suffering from African Coast Fever, or other infective disease.

THE SIGNIFICANCE OF SOME RESPIRATORY TROUBLES.

BY G. MAYALL, M.R.C.V.S., NORWICH.

THE significance of some breathing troubles in equines will chiefly be brought home to us in practice in connection with examinations as to soundness and auctioneers' warranties. There is a roughness or harshness of respiration we sometimes hear which we cannot justly designate as unsoundness. It is probably due to big bronchi, bronchioles and alveoli, and small windpipe, larynx, nasal cavities, and perhaps nostrils. The matter of slight whistling we not unseldom hear, and then it is well to be sure that the subject is not suffering from a cold, in which case in order to be fair, we should state the fact and re-examine the animal on another occasion. The broken-winded examplar does not, as a rule, need much acuteness to detect, but a surfeit of tallow balls may have greased the machinery and made it run smoothly for a sale period. Soiled hocks or tail should open our eyes in this connection, and it is well to look for them. A cart mare with excellent action, a grand mover, but in poor condition, was given a good test for her wind, and passed sound. A good deal of pains was taken in the matter, and not much comfort was felt after passing her, but fortunately the writer was past the time when one lies awake at night thinking about one's cases. Sent for on the

morrow to see her on account of a peculiar flickering of the flanks, it was thought that possibly an undetected pleuritic subject had been passed. The mare came on œstrum, however, very plainly the next day, and has been an excellent servant for some years. There is little doubt the movement of the flanks was of reflex origin, and due to ovarian and uterine disturbance. A word of caution may now be given with regard to the old-standing pleuritic patient with hydrothorax. All horses with hydrothorax do not die quickly. On the contrary they may live for months, if not for years. The man of fair experience will probably call to mind horses that have been passed sound and died within a short period of examination. The *post mortem* has revealed many fibrinous shreds, sometimes of honeycomb appearance, and much hydrothorax. Even the cute man who buys good-looking horses without a veterinary examination may be "had" here. Cart animals especially I have known escape detection, and it is wonderful what a lot of mischief may be found in the thoracic cavity that shows by no means a proportionate disturbance outside. The examination of the respiratory movements when the horse is standing perfectly quiet will give quite as much, if not more information in these cases, than when he is exerted, but we do not always remember and act on this.

Of all warranties that leave scope for difference of opinion "a good worker" probably heads the list. Yet common sense rather than technical knowledge would seem necessary to decide the point. A good worker is of more value than a smart man, but the description is almost as vague. A slight whistler and a commencing broken-winder are often *not bad* workers, and in this world, although the description may not be exact, and would not suit some consciences, it is often best to label anything for sale as *good* rather than *not bad*. It leaves room for the exercise by the buyer of the *caveat simptor* motto, which, as is known, means "let the buyer beware."

Clinical Articles.

PURULENT METRITIS.

BY C. V. DALRYMPLE-HAY, TRICHINOPOLY VETERINARY HOSPITAL, MADRAS PRESIDENCY.

A SMALL-SIZE fox-terrier slut, belonging to C. H. Johnson, Esq., I.C.S., was admitted on September 6, 1908, for a purulent bloody discharge from the generative organ. The slut was off feed, dull, and passed stools mixed with blood. On digital examination *per vaginam*, nothing could be felt in the uterus, but the cornua could be felt as hard lumps from outside. Injections of warm antiseptic fluids were tried with good results. As the animal was sinking, Mr. A. Richards, Veterinary Assistant (G.B.V.C.), decided to operate on the 11th, as that was the only chance left to save the slut. With the usual precautions and preliminaries, an incision was made through the skin and muscles. On penetrating the abdominal muscles, there was escape of serous effusion and blood. Both of the coruna having been brought out, the left was found to be ruptured. Uterus was of

normal size. Right horn 5 in. and left 3½ in.; both weighed 8 oz. The uterus and cornua having been removed, as in hysterectomy, the abdominal muscles were sutured with catgut, and the skin with silk. In five days the slut had completely recovered. Temperature was 104° F. on day of operation, falling 2° during the next two days. The slut was sparingly fed on milk and Mellin's food for the first week, but was bright and able to go about.

CEREBRO-SPINAL MENINGITIS IN DOGS.

BY E. H. STENT, M.R.C.V.S., MANCHESTER.

On December 31 last year I was called to see four fox-terrier bitches supposed to be suffering with rheumatism, and for which their owner had been treating them with sodii salicyl. The symptoms commenced in each bitch about a week after whelping, and were: stiffness in gait, grunting on being touched; later, inability to rise, with rapid abdominal breathing. Appetite normal. This condition of things had been going on for six weeks in one bitch, five in another, three in the third, and the fourth was commencing when I first saw them.

I was informed by the owner that No. 1 was much improved, No. 2 better, but the lower half of ribs in a twisted condition, short, painful breathing; No. 3 much pain on lifting around chest, short abdominal breathing, and prominent knuckle on lower third of all the ribs. No. 4 had whelped a fortnight when I saw her. She was lying on her side, unable to rise, grunting with each breath; temperature 103° F. Appetite normal. On placing her on her feet, could stand, but was afraid to move; when started would walk quickly, with very short steps. On moving her head to the right, the tail would curl to the left, and *vice versa;* on raising head suddenly, would collapse. Only slight congestion of conjunctiva, condition of pupil normal, very rapid abdominal breathing; lower half of ribs on each side were drawn in to such an extent that they almost touched. No 3, not being of much value, was destroyed and forwarded to Professor Williams, who made the *post-mortem* examination. The coverings of the whole of the brain and spinal cord were intensely inflamed; the ribs and spinal column showed a remarkable condition of softened bones.

The fact that each bitch had commenced in this manner soon after whelping convinced me that some septic organism had gained entrance to the system per the uterus; therefore, the treatment I adopted was on antiseptic lines, viz., irrigation of the uterus with corrosive sublimate, 1 in 2,000, and gave pot. iodid. internally. I applied an iodine preparation to neck, and gave special nourishment. After seeing the condition of the bones in No. 3 bitch later, I gave the others phosphate of calcium for a time—with benefit, I think. In a week there was a marked improvement, so changed to Easton's syrup, and in another three weeks all had practically recovered, except that the knuckle remained on the ribs. I had the boxes burnt, kennels washed for several days with boiling water containing corrosive sublimate, and advised no more bitches to whelp in these kennels for

a time, but, owing to circumstances, two more bitches whelped last May without contracting the disease.

On August 16 last I was again called to two bitches that had whelped in the same kennels ten days previously. They exhibited the same symptoms as the others, except that the condition of the ribs was not so marked, one of these having had a previous attack. The fact of two having whelped last May without any return of the disease, while three months later others commence with it, seems to me to point to some sporing organism being the cause, the spores of which the disinfectants had not destroyed; but this is the point on which I shall be glad to have the opinions of other members of the profession.

A RARE ACCIDENT DURING PREGNANCY.

BY A. W. NOEL PILLERS, M.R.C.V.S., SHEFFIELD.

THE following case, from its rarity, appears to me worth recording. I have not met with a similar one in practice or during my reading.

An aged grey polo mare, probably about 13, had been put to stud for the first time. She had always been a keen huntress and had won a few races. Pregnancy was normal in all respects, and signs of parturition were just beginning to show themselves, when the owner one morning was informed by a passer-by that the mare was lying down close to the wall of the field and was probably soon going to foal. When he arrived the mare did not attempt to rise, and by the flattened appearance of the ground she must have been down some hours. She seemed very irritable and cold. The ground where the mare was lying was quite level, and moist with dew. There were, however, many young stinging-nettles both under and around her. Halter-shanks were attached to the headstall, and with very little assistance the mare gained her feet. She immediately started to use her fore and hind feet with such vigour that halter-shanks were not long enough to ensure the safety of the person holding her, so a longer rope was sent for. It was thought that the stinging-nettles were responsible for this behaviour. Soon, however, it was noticed that the skin extending from the umbilicus to the mammary gland was, as it were, cracked. Violent kicking still went on, no doubt putting great strain on the structures of the abdominal wall. Suddenly a piece of small bowel protruded, and the mare, feeling great pain, lashed at it with a cow-kick. More bowel came down, and this was entangled with her hind legs. After a violent kick the whole contents of the abdomen fell to the ground, and the mare fell, dying without a struggle. The owner, having saved calves by opening the uterus of injured cows, managed to get the foal out of the mass alive; it, however, only lived about two days. Although the mare was due to foal in three or four days, it is probable that she would have gone longer, as the foal appeared to be more than three or four days before his time. No real cause of this extraordinary death could be found, but it is surmised that the mare became cast in the early morning, although she was not in contact with the wall when found. The effect of this, together with that of the stinging-nettles, no doubt proved too great a strain for the apparently weak abdominal wall.

A FORM OF SKIN DISEASE IN THE DOG.

BY J. F. CRAIG, M.A., M.R.C.V.S., PROFESSOR IN THE ROYAL VETERINARY COLLEGE OF IRELAND, DUBLIN.

THE subject of this affection was a black-and-white fox-terrier dog, aged about 3 or 4, in very moderate condition. It was brought to the Royal Veterinary College of Ireland for treatment on March 6 last.

The history accompanying the patient was to the effect that it had suffered from the present skin disease for some weeks previously, and had been treated with several applications of sulphur ointment, but had become worse instead of better with the treatment adopted. The animal had been noticed to scratch itself a great deal. The head was principally affected. A large, raw wound, about the size of a half-crown, had formed on the face a little below the left eye, no doubt partly due to the scratching. The skin around that eye had been denuded of hair, and presented a shining appearance like a glossy piece of paper. Little dark areas about the size of a barley grain were scattered over the skin around both eyes, and proved to be subcutaneous hæmorrhages. Some of these were raised a little above the level of the surrounding skin, and contained a thick fluid of a dirty-brown colour. At some points these little lesions had burst, and the discharge adhered to the skin for a short distance below. The ulcer left was pouting, and in most places only about $\frac{1}{8}$ in. broad. A few lesions of a similar nature were also present, in patches of about $\frac{1}{2}$ in. in diameter, on inner side of the left thigh and on both fore legs. The animal fed well, and in other respects appeared normal. Films from the contents of the lesions were examined. They contained broken-down blood corpuscles, immense numbers of polymorpho-nuclear leucocytes, and large lymphocytes. These latter, in a few instances, presented one or two cell inclusions. No bacteria or other parasites could be found in the fluid taken direct from the unbroken lesion.

Treatment Adopted.—The animal was given a pill containing 2 grains calomel, and was put on an exclusively meat diet consisting mostly of boiled paunch. A draught containing liq. arsenicalis and syr. ferri iodi. āā, ηv. was prescribed to be administered daily. The areas of skin showing lesions were first washed with soap and water, and then painted with a liniment consisting of tinct. of iodine diluted with three times its volume of water.

Course of the Disease.—Within two days considerable improvement was noticed. Behind the lower jaw, in the inter-maxillary space, however, a large bulla, about the size of a hazelnut, was found, and another of similar size was observed on the outer side of the left leg. These were opened and treated like the other lesions.

On March 16 the hair was beginning to grow over the skin in the neighbourhood of the eyes. The shining condition of the skin had entirely gone, and the skin had nearly returned to the normal. The wound under the left eye had been reduced in size to one-half, and a scab had formed over it, but underneath this scab a small quantity of discharge had collected. The scab was therefore removed and the wound washed and treated with tinct. iod. in water. Great care required to be taken with the external application, in order to avoid injuring the eyes.

From the 16th the liquor arsenicalis was discontinued. About a week later the animal had almost completely recovered, and was seen a fortnight afterwards with scarcely a hint of the old lesions on its skin.

What was the nature of the affection? It was not eczema, in the strict sense of the term, and no parasites could be found to indicate the cause. Had the cell inclusions anything to do with its production? One can only conclude, in the present state of our knowledge of skin diseases, that if the cause is an organismal one, it is possibly either one of these cell inclusions or of the nature of an ultra-visible virus.

TWO INTERESTING CASES OF PROLAPSE.

BY JOS. EDDES TAIT, M.R.C.V.S., FORRES.

(1) Amputation of the Uterus in a Ewe.

One day, as I was passing a crofter's house, I was asked to look at a ewe, whose "lamb bed" was said to be hanging out. I found the patient to be a ewe, aged 3, which had had two live lambs three days previously, and the protruding mass consisted of the uterus, which had become very much soiled and gangrenous, being quite insensitive to the touch. The owner had made several attempts to return it, and this, combined with the fact that the animal had been lying down and had made it very filthy, caused me to think very unfavourably of the prognosis. However, I passed a large needle and double thread through the centre of the mass, after thoroughly cleansing it as well as was possible with warm carbolic acid and water, and tied the ends off around it on either side. The part below this was then amputated with a knife about ½ in. below the ligature. No hæmorrhage resulted, and the stump, having been covered with carbolic oil, was returned into the vagina. Tea and milk were given as a drench every four hours, as she would not feed and appeared very dull; and, as she strained a great deal, a teaspoonful of tincture of opium was given twice a day. After the second day she picked up a little, and the straining gradually became less marked, the animal eventually making a most excellent recovery. Within a week, except that she was thin and weak, she was as well as ever.

(2) Amputation of the Rectum in a Dog.

The patient, a pointer puppy, had on several occasions everted the rectum, but the keeper always managed to return it until now. When brought to me, there were about 5 in. protruding, and I saw that there was no hope except in excision. I performed the operation in the following way: Taking two needles, each with a long single thread, I passed them through the centre, excising the protruding portion. I then picked up the threads where they crossed, and thus made four separate ligatures. These, when tied, enclosed the whole of the wall of the bowel. There was very little straining, and no complication worth comment. Diet was restricted to milk and milk puddings, and recovery was complete and uninterrupted.

From the quantity of worms passed by the dog at different times, I surmised that these were the cause of the prolapse.

DEFERRED DISPLACEMENT OF A SPINAL FRACTURE.

BY D. CHATTERLEY, M.R.C.V.S., AND G. H. WOOLDRIDGE, F.R.C.V.S.,
ROYAL VETERINARY COLLEGE, LONDON.

An aged chestnut hackney gelding was admitted to the infirmary on September 23, the owner complaining of his carrying his head on one side. Examination of the mouth showed very irregular teeth, and wounds and large ulcers on the buccal mucous membrane, which had evidently been caused by the rough edges of the teeth, and no doubt contact of the teeth with these wounds was responsible for the head being carried to the side which appeared most sore. As there were prominent hooks on the first molars, it was decided to cut them with shears, and on September 24 the horse was cast for that purpose. He went down easily, but during the operation he struggled violently. Beyond this there was nothing special to note, and, the operation completed, the horse rose without difficulty and walked to his box.

The following day he was very stiff in his movements, and off his feed. The former was ascribed to the struggling, and the latter to the soreness of his mouth. From the day of operation until September 30 he remained standing; the stiffness did not wear off, and his appetite did not return.

On the morning of September 30, six days after casting, he lay down for ten or fifteen minutes, and then re-assumed the standing position. During the afternoon he was again lying down. At 10 p.m. he was discovered making futile efforts to regain his feet. He frequently raised his fore-parts, but could not control his hind limbs, and after maintaining the dog-sitting position for a few seconds he fell on his side, and violently dashed his head against the floor and walls of his box. Steam was rising from him in clouds, and his sides were running with perspiration. Rectal temperature was normal. Pin-pricking of the hind limbs failed to produce any response. His dock, though weak, was capable of being held fairly rigid. No fracture was discovered per rectum. Palpation did not reveal any fracture of the vertebræ. Spinal injury was, however, suspected from the history and symptoms. The horse died at 3.30 a.m. on October 2.

On *post-mortem* examination, the last dorsal and first lumbar vertebræ, which during life had become anchylosed, were found to have been broken. The time when the back was fractured is difficult to fix. The fact that the animal regained his feet after casting would at first remove one's suspicions from regarding the casting operation as the probable cause; but one's suspicions returned when one remembered that the animal was stiff afterwards and remained standing so long. Another strange point is that the horse went down and regained his feet on the 30th, and there is just a possibility that he broke his back in getting up, though it is more probable that he displaced the fractured part in rising, and that the case was one of fracture with deferred displacement, the bones having been broken during the struggling when he was cast.

It was fortunate, to a certain extent, that it was at the owner's suggestion that the horse was cast, since he knew it would be impossible do do anything with the mouth standing, the horse being so restless and spirited.

AN EQUINE HERMAPHRODITE.

BY F. D. W. OATLEY, BAYSWATER, W.

I ENCLOSE a photograph of a hermaphrodite, which I thought might be of some interest. Below the anal aperture is a fold of perineum some 15 in. long, below which comes the vaginal opening—or what appears to be the vaginal opening. This opening seems to be a combination

of vagina and prepuce. A penis about 5 in. in length protrudes from the opening when the horse makes water. In front of the penis-sheath are found rudimentary testes and scrotum, immediately adjoining which are the teats of the mare—only partially developed, of course, but still quite recognizable. The male element seems to predominate throughout, which, I believe, is a rare occurrence.

RINGWORM IN CATTLE.

RINGWORM in young cattle can be cured by thoroughly cleaning the parts with tar soap and warm water, and then painting all affected parts with a saturated solution of iodine. May need a number of applications.—*Minnesota Farmers' Institute Annual.*

Abstracts and Reports.

EXPERIMENTS WITH ENGLISH AND SOUTH AFRICAN REDWATER.

BY DR. ARNOLD THEILER, C.M.G., GOVERNMENT VETERINARY BACTERIOLOGIST FOR THE TRANSVAAL.

In order to overcome the mortality caused by ordinary redwater when exposing imported cattle on the South African veld, I decided to conduct some experiments in this connection, and was fortunate in obtaining the assistance of Mr. Stockman, Principal Veterinary Surgeon of England.

The experiments were performed with a three-fold object, namely, to test (1) whether English and South African redwater are identical; (2) if English cattle immunized against English redwater would thereby acquire any immunity against the ordinary redwater of South Africa; and (3) if English heifers inoculated in England with South African redwater would be immune against our disease when exposed to natural infection in South Africa.

Accordingly, six heifers were purchased on our behalf by Mr. Stockman, and were treated by him in England. One lot were injected with English redwater, the second batch with South African redwater (or, as it is commonly known, ordinary redwater), and the remaining two heifers with both English and South African redwater.

I am greatly indebted to Mr. Stockman for making careful examinations of these animals, and it is from his notes that the following particulars of temperatures and blood examinations have been obtained.

Experiment No. 1.—English Heifers Injected with English Redwater.

(*a*) Heifer 428: Injected in England subcutaneously on July 25, 1906, with 5 cc. defibrinated blood of a heifer (which had previously been inoculated with blood obtained from a natural case of redwater in Hampshire, but which did not react in any marked degree, and it is highly probable that she did not contract the infection).

Heifer 428 did not show any reaction, and all smears examined from the date of injection to September 1 gave negative results.

On September 1, 1906, 428 received an injection of 10 cc. defibrinated blood from an English cow which had recovered from a natural attack of English redwater. Temperature rose on the eighth day to 105° F. in the morning, and 106° in the evening, returning next day to normal. On the twenty-fourth day it reached 104·6° in the evening, but fell again to normal two days later.

Examinations of blood preparations from September 8 to 26 gave negative results, and the blood-count on October 4, 1906, showed the number of red cells to be between six millions and seven millions per c.mm.

(*b*) Heifer 430: Injected in England with 5 cc. defibrinated blood of an English heifer (which had previously been inoculated with English redwater, but the injection probably failed to infect the beast). Heifer 430 did not show any reaction, and no piroplasms were found in the blood preparations.

On September 1, 430 was inoculated subcutaneously with 10 cc. defibrinated blood of an English cow which had recovered from a natural attack of English redwater.

Temperature of 430 rose to 102° F. on the sixth day, and to 104° in the evening of the eighth day. Smears examined on this latter date showed distinct but only small numbers of piroplasms (English redwater); the temperature now fluctuated between 102·6° and 105·2° for the next two days, and regained normal on September 11. Another, but slight, reaction ensued from September 23 to 28.

EXPERIMENT No. 2.—ENGLISH HEIFERS INJECTED WITH SOUTH AFRICAN REDWATER.

(*a*) Heifer 429: Injected in England on September 1, 1906, with 5 cc. defibrinated blood of an English heifer (which had been infested with the infected blue ticks I sent to Professor Sir J. McFadyean in 1905, and, as a result, developed South African redwater and recovered).

On the ninth day the temperature of 429 rose to 103° F., but examination of smears were negative. On the tenth day temperature recorded 105·2° in the evening, and piroplasms (ordinary redwater) were found in the smears. The temperature fluctuated for the next four days, but returned to normal on September 15. Piroplasms (ordinary redwater) were again noted on the eleventh day.

(*b*) Heifer 432: Injected on September 1, 1906, with 5 cc. defibrinated blood from the English beast which had been infected with blue ticks and contracted South African redwater.

Temperature of 432 rose to 103° on the sixth day, but examination of smears were negative; regained normal on the seventh to ninth days, but recorded 105° on the tenth day, when blood examinations were again negative. Piroplasms (ordinary redwater) were noted for the first time, and only on the following day. Temperature remained high for the next three days, and regained normal on September 16.

EXPERIMENT No. 3.—ENGLISH HEIFERS INJECTED WITH ENGLISH AND SOUTH AFRICAN REDWATER.

(*a*) Heifer No. 431: Injected on July 25, in England, with 5 cc. blood from an English heifer (which had previously been inoculated with English redwater, but this injection apparently did not cause the beast to contract the disease).

The temperature of 431 remained normal, and all blood examinations gave negative results.

On September 1, 431 was injected subcutaneously with 10 cc. blood of an English cow which had recovered from a natural attack of English redwater.

Temperature rose to 104·2° in the morning of the eighth day, and to 106° in the evening. Blood examinations on this date were negative. Temperature remained high for the next two days, but returned to normal on September 10.

On September 24, 431 was injected subcutaneously with 10 cc. defibrinated blood of an English heifer (which had been infested with infected South African blue ticks, causing her to contract South African redwater). Heifer 431 showed a rise of temperature, consequent on this inoculation, to 105° in the evening of October 1, 1906—the seventh day. Piroplasms (ordinary redwater) were noted in the blood

on this date, and a high temperature was recorded for the next three days.

(*b*) Heifer 433: Injected in England, on July 5, subcutaneously with 5 cc. defibrinated blood of an English beast (which had been inoculated with English redwater, but, apparently, did not contract the infection). The temperature of 433 remained normal, and all blood examinations were negative.

On September 1, 1906, 433 was injected with 5 cc. defibrinated blood of the English beast which had contracted South African redwater from the infestation of infected blue ticks. Temperature of 433 rose to 103° on the sixth day, but examinations of blood did not reveal any piroplasms (ordinary redwater). The temperature now fluctuated for the next four days, and no piroplasms (ordinary redwater) were seen until the eleventh and twelfth days, when the temperature regained normal. A short secondary reaction noted from the twenty-second day, lasting for a few days, but no piroplasms (ordinary redwater) were found.

On September 24, 433 was injected with 10 cc. defibrinated blood of a beast which had recovered from a natural attack of English redwater. Ten days later 433 showed a slight reaction, and on this date and the following days piroplasms (English redwater) were present. Temperature regained normal on October 6.

Notes on Heifers 428 *and* 430.

From Mr. Stockman's notes on the behaviour of heifer 428 in England, I am not inclined to consider it as immune against English redwater in view of the atypical reaction and the absence of piroplasms (English redwater). Heifer 430 undoubtedly underwent an English redwater reaction, and should, therefore, be immune against this disease.

Notes on Heifers 429 *and* 432.

The injection of English heifers with a strain of virus originating from infected blue ticks sent from the Transvaal, and passing through an English beast caused, in both instances, the appearance of piroplasms (ordinary redwater), accompanied with a typical South African redwater reaction. Therefore, these two heifers should be immune against South African redwater.

Notes on Heifers 431 *and* 433.

The injection of English redwater into heifer 431 did not cause the appearance of piroplasms (English redwater), and the reaction was atypical. A subsequent injection of South African redwater caused the appearance of piroplasms (ordinary redwater) in the English heifer, together with a temperature reaction.

Heifer 433 was injected with South African redwater, in the first instance, and, as a result, showed piroplasms (ordinary redwater) accompanied with a temperature reaction. Twenty-four days later it was injected with English redwater, and a slight reaction ensued, accompanied with piroplasms (English redwater). Heifer 433 should, therefore, have acquired immunity against both English and South African redwater.

Conclusions.

It would be seen from these notes that, of four animals inoculated with English redwater, two failed to react or to show piroplasms (English redwater), and, in the other two instances, a reaction ensued, accompanied with the appearance of piroplasms (English redwater). Therefore, it is safe to say that English redwater is not always inoculable, and differs in this respect from South African redwater.

Experiment No. 4.

To note whether (1) South African animals, susceptible to ordinary redwater, contract English redwater when injected with blood from animals previously inoculated with this disease; and (2) whether these South African animals prove immune against ordinary redwater when injected with this disease (*P. bigeminum*). (The South African animals used in this experiment were born and bred in Cape Colony in a district free of ordinary redwater, directly imported to the Transvaal, hence they were susceptible to the disease.)

Heifers Nos. 400, 418, 421, and 422 were all injected on December 13, 1906, with blood of English heifer 428. Heifer 428 (compare Experiment 1, (*a*)) had shown a temperature reaction consequent on the inoculation with English redwater, but no piroplasms (English redwater) were noted in the blood.

These South African heifers were subsequently tested on their immunity against ordinary redwater by the injection of a strain of virus emanating from a natural case of ordinary redwater complicated with *P. mutans* (a form of gall-sickness of South African cattle).

(*a*) Heifer 400: A two-year-old from Aliwal North, and susceptible to ordinary redwater. Injected on December 13, 1906, subcutaneously with 10 cc. blood of heifer 428. As there were no results from this injection, heifer 400 was injected subcutaneously on January 3, 1907, with 50 cc. blood of heifer 428. Temperature remaided quite normal, and, with the exception of blood changes (poikilocytosis) on rare occasions, all blood examinations were negative.

Tested on immunity against ordinary redwater by the subcutaneous injection of 10 cc. blood of heifer 425 containing *P. bigeminum* (ordinary redwater) on January 30, 1907. Reaction from the fifth day, reaching 104·6° four days later, and remaining high for the next three weeks. Blood changes (poikilocytosis) and the lesions of *P. mutans* (a form of gall-sickness) appeared, but *P. bigeminum* (ordinary redwater) was not seen.

On April 26, 1907, 400 was injected with 10 cc. blood of heifer 435, which was an imported English heifer, and had been rendered immune against ordinary redwater. This injection did not cause any temperature reaction in 400, nor did *P. bigeminum* (ordinary redwater) appear.

(*b*) Heifer 418: Two-year-old heifer from Aliwal North, and susceptible to South African redwater. Injected on December 13, 1906, subcutaneously with 10 cc. blood of heifer 428. No reaction; all blood examinations proved negative. Accordingly, on January 3, 1907, heifer 418 was injected subcutaneously with 50 cc. blood of heifer 428. The temperature remained quite normal, and no piroplasms (English redwater) were found in the blood smears. Spirillum (spirillosis fever of cattle, and which may be considered as a third

form of gall-sickness) appeared on the third day after the second injection, and, five days later, blood changes (poikilocytosis) were noted, remaining for another two days.

Tested on March 26, 1907, by a subcutaneous injection of 10 cc. blood of heifer 425, an animal which contained *P. bigeminum* (ordinary redwater) and *P. mutans* (a form of gall-sickness) in its blood. A slight temperature reaction followed, and, on the twenty-sixth day *P. bigeminum* (ordinary redwater) appeared.

(*c*) Heifer 421: Two-year-old heifer from Aliwal North, and susceptible to ordinary redwater. Injected on December 31, 1906, intrajugularly with 5 cc. blood of heifer 428. As no reaction ensued, and all blood examinations were negative, heifer 421 was reinjected subcutaneously on January 3, 1907, with 50 cc. of heifer 428. With the exception of a sharp rise to 104° on the third day, after this latter injection, the temperature remained normal, and no piroplasms (English redwater) were noted in the blood.

Tested on January 30, 1907, by subcutaneous injection of 10 cc. blood of heifer 426 containing *P. bigeminum* (ordinary redwater). Reaction from the fifth day, *P. bigeminum* (ordinary redwater) being noted four days later.

(*d*) Heifer 422: Injected on December 13, 1906, subcutaneously with 10 cc. blood of heifer 428. Temperature remained normal until the seventeenth day, when a sharp rise occurred, reaching 105·2°; but all microscopical examinations were negative. Heifer 422 was, accordingly, reinjected on January 31, 1907, subcutaneously with 50 cc. blood of heifer 428. Again no reaction ensued, the temperature consistently remaining about 102° to 103°. All examinations negative, with the exception of the presence of rare *T. theileri* (another form of gall-sickness) on January 6, 1907. Tested on January 30, 1907, by subcutaneous injection of 10 cc. blood of heifer 425, containing *P. bigeminum* (ordinary redwater) and *P. mutans* (a form of gall-sickness). Reaction from the fifteenth day, reaching 104·2° the following day, and remaining high for about two weeks. *P. bigeminum* (ordinary redwater) noted on the twenty-fifth day.

The following South African cattle—Nos. 401, 419, 420, 423, and 424—were all injected with blood of English heifer No. 430. This heifer (compare Experiment 1, *b*) had been inoculated in England with English redwater, and, as a result, gave a temperature reaction accompanied with the presence of piroplasms (English redwater).

(*e*) Heifer 401: A heifer, aged 2, from Aliwal North, and susceptible to ordinary redwater. Injected on December 13, 1906, subcutaneously with 10 cc. blood of English heifer 430. As this inoculation failed to cause a reaction, and no piroplasms (English redwater) were noted in the blood, heifer 401 was reinjected on January 3, 1907, subcutaneously with 50 cc. blood of 430. Again no temperature reaction ensued, and all blood examinations were negative.

Tested on January 30, 1907, by subcutaneous injection of 10 cc. blood of heifer 425, containing *P. bigeminum* (ordinary redwater). Reaction from the sixth day, returning to normal seven days later. Secondary reaction from the nineteenth day, reaching 107·4° on the thirty-third day, and during which *P. bigeminum* (ordinary redwater) appeared.

(*f*) Heifer 419: A heifer, aged 2, from Aliwal North, susceptible

to ordinary redwater. Injected on December 13, 1906, subcutaneously with 10 cc. blood of heifer 430.

No temperature reaction, and all examinations of blood negative. Heifer 419 was then reinjected on January 3, 1907, subcutaneously with 50 cc. blood of heifer 430, with the result that the temperature remained normal, and no piroplasms (English redwater) or blood changes were noted.

Tested on March 26, 1907, by subcutaneous injection of 10 cc. blood of heifer 425, an animal immune against ordinary redwater. Reaction six days later, reaching 104·2° on April 3, 1907. *P. bigeminum* (ordinary redwater) noted on the ninth day.

(*g*) Heifer 420: A heifer, aged 2, from Aliwal North, and susceptible to ordinary redwater. Injected on December 13, 1906, subcutaneously with 10 cc. blood of English heifer 430. No result, and 420 was accordingly injected on January 31, 1907, subcutaneously with 50 cc. of heifer 430. Temperature remained quite normal, and daily examinations of the blood failed to reveal any piroplasms (English redwater).

Tested on immunity on January 31, 1907, by subcutaneous injection of 10 cc. blood of heifer 425, an animal immune to ordinary redwater. Typical ordinary redwater reaction from fifth day, but *P. bigeminum* (ordinary redwater) not present. Secondary reaction from seventeenth day, lasting for about two weeks, during which time *P. bigeminum* (ordinary redwater) and the lesions of anæmia appeared.

(*h*) Heifer 423: A heifer, aged 2, from Aliwal North, and susceptible to ordinary redwater. Injected on December 13, 1906, intrajugularly with 5 cc. blood of heifer 430. As this injection failed to produce any results, 423 received a subcutaneous injection of 50 cc. from heifer 430 on January 3, 1907. With the exception of a sharp rise to 104·2° eight days later, the temperature remained normal, and no piroplasms (English redwater) were seen in the blood preparations.

Tested on immunity on January 30, 1907, by subcutaneous injection of 10 cc. blood of heifer 426, immune to ordinary redwater. Reaction from the sixth day, *P. bigeminum* (ordinary redwater) appearing three days later.

(*i*) Heifer 424: A two-year-old from Aliwal North, and therefore susceptible to ordinary redwater. Injected on December 13, 1906, subcutaneously with 10 cc. defibrinated blood of heifer 430. Temperature remained normal, and all blood examinations were negative. Accordingly, 424 received a subcutaneous injection of 50 cc. blood of heifer 430 on January 3rd, 1907. No result; the temperature remained normal, and no piroplasms (English redwater) were seen in the blood preparations.

Tested on immunity on January 30, 1907, by subcutaneous injection of 10 cc. blood of heifer 426, an animal containing *P. bigeminum* (ordinary redwater) in its blood. Typical ordinary redwater reaction from the sixth day, but *P. bigeminum* (ordinary redwater) not seen, although blood changes (poikilocytosis) and anæmia (polychromatic cells) were present.

Heifer 424 was again injected on March 8, 1907, with blood containing *P. bigeminum* (ordinary redwater) and *P. mutans* (a form of gall-sickness, from heifer 409. No reaction, *P. mutans* (a form of gall-sickness) only appearing.

Notes on Heifers 400, 401, 418, 419, 420, 421, 422, 423, *and* 424.

With regard to these nine heifers two injections of English redwater blood failed in every instance to cause a reaction, and piroplasms (English redwater) did not appear. A subsequent inoculation of South African redwater caused these injected heifers to contract this disease, and, with the exception of Nos. 400 and 424, *P. bigeminum* (ordinary redwater) appeared in every animal.

Heifers 400 and 424 were reinjected with blood containing *P. bigeminum* (ordinary redwater), the result being that no reaction ensued; nor were piroplasms (ordinary redwater) present.

Conclusions.

I do not feel justified in drawing any conclusions from the results of the injection of heifers 400, 418, 421 and 422 with blood of English heifer No. 428, for, as will be seen from Experiment 1, (*a*) this heifer did not appear to have contracted the infection in England, as no piroplasms (English redwater) were seen, due to an inoculation of English redwater blood, and the reaction was atypical. I therefore consider that the failure of heifer 428 to contract English redwater from the injection of virulent blood is another point in favour of my contention that English redwater is not always inoculable. The results obtained from the other five heifers, however, seem to be conclusive, as heifer 430 was certainly infected with English redwater.

Therefore, English redwater was not inoculable in our five South African heifers, and, accordingly, when tested, they all contracted ordinary redwater, proving that they had not acquired any immunity against South African redwater.

Exposure Experiments with the Imported Heifers.

Continuing on the lines of the arrangement made between Mr. Stockman and myself, the imported Ayrshire heifers were exposed on the Linwood farm, near Pretoria. The temperatures were taken daily, and the blood examined from time to time.

Heifer, No. 428: Exposed on January 5, 1907. Three days after the temperature commenced to rise, reaching 106°, and constantly remaining high during the next forty-seven days. Nothing particular was noticed in the blood at the beginning of this reaction, but on the thirty-fifth day, *P. bigeminum* (ordinary redwater) was noticed, remaining for some days, but disappeared from the thirty-ninth day. Blood changes (poikilocytosis) were occasionally noted, and the temperature returned to about normal on February 26. A second rise ensued on March 4, *P. bigeminum* (ordinary redwater) not being noticed, but blood changes (Poikilocytosis) and marginal points (the sequel of ordinary redwater) appeared, and the animal remained very weak. Death occurred on March 17 with all the lesions of the sequel of ordinary redwater. The anæmia was so pronounced that the blood consisted almost entirely of basophile, polychromatic, and nucleated cells (acute anæmia).

Heifer, No. 430: Exposed at Linwood on January 5, 1907. Temperature commenced to rise on January 12, and then oscillated very irregularly for the next month; microscopical examination of the blood at repeated intervals failed to relieve *P. bigeminum* (ordinary redwater), but blood changes (poikilocytosis) were noted. Recovered.

Heifer, No. 429: Exposed at Linwood on January 5, 1907. Reaction commenced six days after exposure, when the temperature rose to over 106°, and remained high for the following fourteen days. Spirillum (spirillosis-fever of cattle), anæmia (basophile cells), blood changes (poikilocytosis), and marginal points (sequel of ordinary redwater) were noted, but *P. bigeminum* (ordinary redwater) did not appear. Recovered.

Heifer, No. 432: Exposed at Linwood on January 5, 1907. Irregular temperature noted soon after, and rose about three weeks later to a high elevation, touching 105·8°; *P. bigeminum* (ordinary redwater), blood changes (the lesions of poikilocytosis), anæmia (basophile granulations and polychromatic cells) were present. Recovered.

Heifer, No. 431: Exposed at Linwood on January 5, 1907. This animal also showed an irregular high temperature, reaching over 105°, and, as the maximum, recorded 106°. Blood changes (poikilocytosis), anæmia (basophile granulations), and spirillum (spirillosis-fever of cattle) were noted. *P. bigeminum* (ordinary redwater) was not present. Recovered.

Heifer, No. 433: Exposed at Linwood on January 5, 1907. Irregular temperature noted on January 12, commencing with 106°, remaining high for the next fourteen days, and touching 106·8° on January 31, 1907. Anæmia (basophile granulations, polychromatic cells), and blood changes (poikilocytosis), accompanied with the sequel of ordinary redwater (marginal points) were noted. *P. bigeminum* (ordinary redwater) was not noted, but the lesions of anæmia increased, and the animal died as the sequel of ordinary redwater.

RÉSUMÉ.

Heifer No.	Particulars	Results when exposed to natural infection of ordinary redwater.
428	Not immune to English redwater ...	Reaction with *Piroplasma bigeminum*; died of ordinary redwater.
430	Immune to English redwater ...	Reaction; recovered.
429	,, ordinary redwater ...	,, ,,
432	,, ,, ,, ...	Reaction with *Piroplasma bigeminum*; recovered.
431	Immune to ordinary redwater, but susceptible to English redwater	Reaction; recovered.
[433	Immune to both English and South African redwater	Reaction; died of sequel of ordinary redwater.

I have already expressed the opinion that English redwater does not offer protection against our ordinary redwater. Of the four animals which had *P. bigeminum* (ordinary redwater) in their blood, due to the primary injection, after exposure they all more or less showed lesions which could be identified with a new reinfection of ordinary redwater. It will be seen from the experiments quoted that the inoculation of English cattle with South African redwater did not give a complete guarantee against a natural infection of ordinary redwater, and we may to some extent explain the reason for this apparent failure. The animals arrived in December; almost directly after they were exposed, and, naturally, at a time when the tick infection was

at its maximum, so that they had to become acclimatized under very adverse conditions. From previous experience we know that an animal immune against redwater may break down in immunity under the influence of a subsequent heavy tick infection, and, taking this fact into consideration, together with the loss of only one English heifer, I am of opinion that the experiment has afforded very encouraging results.

At a later date I hope to continue these investigations, but to take further precautions that the injected cattle, directly after their arrival from England, be kept in a paddock to ensure acclimatization, and exposed on the veld when the tick infection is at its minimum.

(*Transvaal Agricultural Journal.*)

GLANDERS.[1]

BY H. A. WOODRUFF, M.R.C.V.S., PROFESSOR IN THE ROYAL VETERINARY COLLEGE, LONDON.

This is a contagious disease naturally affecting horses, asses, and mules, but communicable to man and to some other animals. It is due to the *Bacillus mallei*, discovered and cultivated in 1882 by Löffler and Schütz, and, like anthrax, is a very ancient disease. Its distribution is really coextensive with that of the horse, and its prevalence depends largely on the density of the equine population. It is common in Great Britain, in every country in Europe, in South Africa, and in the United States, from the latter three of which horses have been imported or re-imported into Great Britain within the last few years. The prevalence of glanders in Great Britain is, as is the general case, dependent on the number of horses gathered together, and consequently the disease is chiefly found in the large towns—especially London, Liverpool, and Glasgow. There is a marked and progressive diminution in the number of cases in zones at an increasing distance from these large centres, pointing to the fact that the disease is disseminated by dispersal of infected animals from the towns into the adjoining country districts. Since the use of the diagnostic mallein test this tendency for the disease to spread to country districts has increased, and it is a satisfactory feature of the recently promulgated regulations that they will largely put a stop to the very dangerous practice of testing horses and selling the reactors to continue the spread of the disease.

Animals Susceptible.—Besides equines, the natural victims of glanders, the goat and cat may contract the disease from horses; the sheep is also susceptible, and guinea-pigs and rabbits are readily infected experimentally. The dog, though not immune, is relatively unsusceptible, and experimental inoculation is rarely fatal. Swine, too, are infected only with difficulty, and bovines are immune; but for all practical purposes horses, asses, and mules are the only animals which need be considered in discussing measures for the eradication of the disease.

The Causal Organism.—The *B. mallei* is a small, short bacillus,

[1] Read before the Veterinary Section of the Public Health Congress at Buxton. Abstracted from the *Buxton Advertiser.*

2 to 3 μ in length, non-sporulating, probably motile, and facultative aerobe. It stains rather poorly and slowly with aniline dyes, not at all by Gram's method, is easily decolorized by acids, but stains best with Löffler's alkaline methylene blue. It is found in the lesions and in the discharges from them, and it is an obligatory parasite. The tissues generally and the blood are rarely invaded by the organism, except in the very acute generalized cases, which are rare.

Resistance.—Since it does not sporulate, the organism is not very resistant to the ordinary methods of disinfection. Chemical disinfectants, such as 1 in 1,000 perchloride of mercury or 5 per cent. phenol, quickly destroy it, and in moist heat it is killed in a few minutes at 100° C. Desiccation in warm, dry air and sunshine destroys the vitality of the organism in pus or glanders discharges in two or three weeks, but it will retain its virulence for much longer periods—even three to four months—in dark, cool, moist situations, as in the corners of stables and buildings, or in harness and clothing. In water and about drinking troughs it may remain active for a considerable time, probably two or three weeks.

Methods of Infection.—Horses may be infected in any of the three usual modes, namely, by ingestion, inhalation, or inoculation. Ingestion of infective material may occur by means of contaminated drinking water out of public drinking troughs or common stable buckets; or by fodder soiled by discharges, as in common mangers, nose-bags, and in inn stables. Inhalation may take place in badly ventilated stables, by means of partially dried discharges from a neighbouring horse which is affected. Much less commonly in the case of horses an animal may be infected by material containing the bacilli being inoculated into some skin wound.

Symptoms.— In the great majority of cases in horses the disease runs a chronic course, and it is not till the disease is advanced that clinical symptoms are shown. These are, briefly, unthriftiness of the animal and gradual loss of flesh; enlarged and frequently fixed submaxillary lymphatic glands; nasal discharge, usually of a yellow, rather thin, glutinous material; and in advanced cases evident ulceration of the mucous membrane of the septum nasi. In addition, there are likely to be some of the lesions of the so-called farcy—which is simply the name given to the cutaneous lesions of glanders. These consist in the appearance of small subcutaneous abscesses — "farcy buds"—often about the hind limbs or trunk, together with, in many cases, evidence of thickening or cording of the lymphatics round about these lesions. Sometimes along with one or more farcy buds and corded lymphatics the whole of one hind limb may be swollen from a general infection of the lymphatics of that part, and this enlargement will tend to be chronic.

Lesions.—The commonest and most characteristic internal lesions are those in the lungs, namely, small nodules or tubercles, from the size of a grain of wheat up to that of a pea, which, in a typical case, are hard or shotty to the touch, and may be few or very numerous. On section these tubercles usually show a pale centre, due to an invasion of leucocytes, with a hæmorrhagic zone round it. In old tubercles there may be some grittiness on section from deposition of lime salts.

The bronchial and tracheal glands are often affected, being enlarged, swollen, and somewhat œdematous, often becoming indurated later. Next in order of frequency are the lesions on the nasal mucous mem-

brane, which consist in ulcers, sometimes small and round, at other times large and irregular.

Mallein Test.—In the absence of clinical symptoms it is highly important to be able to diagnose glanders in horses which have cohabited with infected animals, and for this purpose the mallein reaction is invaluable. Mallein is a substance obtained by cultivating the *B. mallei* on bouillon for five or six weeks at 30° C. The culture, containing organisms and toxins, is then sterilized by steam, and subsequently filtered and preserved by the addition of ½ per cent. phenol. This material, when injected in suitable dose into a horse affected with glanders, produces a reaction in which (typically) the temperature gradually rises during the fifteen hours after injection from 100° F. to 103° or 104° F. In addition, the local reaction at the seat of inoculation affords a valuable indication in cases of glanders. This local swelling is much larger than would be caused by injecting mallein in a non-glandered horse, and a still more characteristic feature is that in an affected animal the swelling is not at its maximum until about the thirty-sixth hour, and it will remain for three or four days, whereas in a non-glandered horse the swelling is very temporary, not being apparent after twenty-four hours.

Infection in Man.—Man is most commonly infected with glanders from an affected horse by means of nasal discharge or pus from a farcy bud or local lesion. The infected material may get on to the hands of grooms or stablemen, and so infect wounds, or be ingested with food; or nasal discharge may be scattered and blown about—sometimes reaching the mouth, nose, or conjunctiva, or infecting some wound, pimple, or scratch. Another way of infection is by abrasions of the hands when examining the teeth of horses, or giving medicine by balling, or in examining the nose. Other modes of infection, by eating the flesh of glandered animals, or by inhalation of desiccated glanders discharge may occur, but so rarely, if at all, as to require no attention in this paper.

Prevalence in Man.—Man is undoubtedly less susceptible to glanders than are equines, and the disease is practically confined to men who have to do with handling and grooming horses—such as grooms, ostlers, veterinary surgeons, and others. A few cases have occurred in which surgeons and nurses have been infected from a human patient in hospital. The number of deaths registered as due to glanders in any one year is always few—usually five or six (1903) in England and Wales—but this is probably greatly under-stating the prevalence, since it appears likely that many cases, which are in reality glanders, are never diagnosed as such; and, again, these figures take no account of the number of chronic cases of glanders in man.

Effect in Man.—Human glanders may take either the acute or the chronic form. In acute glanders there is an incubation period of three or four days, followed by acute fever. At the seat of inoculation there is swelling and pain, the nasal mucous membrane becomes ulcerated and there is a discharge from the nose. Following on these symptoms the patient very frequently gets sub-acute pneumonia, and dies in eight or nine days. When the infection has taken place through an abrasion or wound of the skin, the seat of inoculation becomes greatly inflamed, and the lymphatics around the area distended, corded, and painful, and in a short time multiple abscesses break out along their

course. Intramuscular abscesses are common, there are acute pains in the joints and high fever, the condition being fatal in ten to twelve days.

Chronic glanders is much more difficult to diagnose, and simulates chronic coryza. The nasal mucous membrane may be ulcerated, and that of the larynx is often affected. Where the lesions are localized in the skin or periphery there are at first slowly forming rather hard tumours, usually in the extremities. Later these become necrotic, and break down as abscesses, and at this stage the disease may become acute, or it may remain chronic, or, in some cases, recovery may take place, as in the case of Bouley, the eminent French veterinary surgeon.

Diagnosis in a doubtful case should be made certain by bacteriological methods, namely, the mallein test, the serum agglutination test, or the inoculation into the peritoneum of a male guinea-pig of some of the material from the lesions. Thus, for practical purposes, infection of man with glanders is only likely to occur from an affected horse, ass, or mule, or by means of the discharges from such an animal, and, consequently, the class of human being affected is a very limited one, consisting of those who are in frequent attendance on horses. This being so, the obvious method of prevention of human glanders is the eradication of the disease from equines and the prevention of its reintroduction from abroad.

Prevention.—From what has been stated, it will readily be understood that the onus of preventing glanders infection to man or animals falls upon those public authorities responsible for the control of contagious diseases of animals, namely, the Board of Agriculture and Fisheries and the local authorities under their supervision. The present procedure is set out in the Glanders and Farcy Order of 1907, issued by the Board of Agriculture under powers conferred by the Contagious Diseases (Animals) Act of 1894.

Briefly, its provisions are: (1) a "diseased" animal includes such as react to the mallein test—so that animals dangerous as possible sources of infection, but without clinical signs, can now be dealt with; (2) no equines may be imported into this country unless with a veterinary certificate from the port of embarkation that the animal did not, at the time of examination, show symptoms of disease; (3) not only owners of horses, but also all licensed horse-slaughterers, must notify the existence of the disease in live or dead animals, and the medical officer of health of the district must receive a notice of the same; (4) all diseased animals must be slaughtered; (5) the local authority has power to detain all in-contact or cohabiting animals for an indefinite period, or until such time as the owner will consent to their being tested with mallein, those reacting to be slaughtered. Owners objecting to the slaughter of any animal have the right of appeal to the Board of Agriculture; (6) where no clinical symptoms are shown, but a reaction to mallein is obtained, a *post-mortem* examination must be made, and if no evidence of glanders is discovered, compensation is paid up to the full value of the horse, but not exceeding £50. If lesions of glanders are found where there were no clinical symptoms, but only a reaction to mallein, then half value is paid as compensation. These provisions with regard to compensation are very valuable, as providing for the rare cases in which an apparent reaction to mallein is obtained in an animal which on *post mortem* is found free from

glanders. They also provide some fair inducement for owners of studs to allow the application of mallein to all in-contact horses.

Such, then, are the main items in this recent Order, and they mark such an advance in the method of dealing with glanders that one may hope and look for its speedy eradication from equines in this country, and with that the removal of all possibility of infection to man.

Reviews.

DISEASES OF THE DOG AND THEIR TREATMENT. By Dr. Georg Müller and Alexander Glass, V.S. Pp. 419, 93 illustrations and 10 plates. New Edition. Published by Baillière, Tindall and Cox, London. Price 21s. net.

Competent books on diseases of the dog are still very rare, and the work of Müller has been welcomed on the Continent as a standard text-book, whilst the English and American veterinary professions owe Dr. Glass a great debt of gratitude; first of all, for the able manner in which he has translated Dr. Müller's work, and secondly, for the Notes and Additions by which he has enlarged it to its present size. There is no text-book so complete on the medical diseases of the dog, and the book is one which should find a place on every up-to-date practitioner's bookshelf.

Canine work has attained such importance in the daily work of the practitioner that one wonders why the colleges and teaching schools lag so far behind as not to devote a special class to its teaching, and until a few years ago the belated practitioner has absolutely no written authority at all to whom he could appeal; his patients suffering very frequently in consequence. Müller and Glass have filled a much-needed want, and their book is specially strong on the clinical side, whilst the new edition contain considerable additions in the shape of coloured plates and illustrations, which are likely to be of service in aiding diagnosis. Commencing with a well-written chapter on the general aspect of the dog in health and the general methods of examination, the whole of the disorders of the digestive system, of the respiratory organs, of the circulatory apparatus, of the urinary and generative systems, and of the nervous mechanism of the body are dealt with in turn; whilst chapters are devoted to those of the eye, ear, bones, joint, and skin.

Infective and constitutional diseases each receive a chapter to themselves, and the arrangement throughout is very convenient for purposes of reference.

The publishers have done their share of the work well, and we have no hesitation in recommending the work to the notice of practitioners and students.

TRANSVAAL DEPARTMENT OF AGRICULTURE. Report of the Government Veterinary Bacteriologist, 1906-1907.

An official report cannot usually be regarded as something which will be light and interesting reading to anyone who may pick it up; in the main the report before us now is no exception to this rule.

It contains the formal Government Returns and Notices. Many

pages are mere records of experiments carried out in the investigation of horse sickness, and are mainly interesting to those who are occupied in these investigations, and it is when we turn to the experiments with English and South African redwater that we find matter which cannot fail to be of interest to those engaged in veterinary work in this country. Sir John McFadyean and Mr. Stockman have rendered Dr. Theiler valuable assistance in his attempts to determine the relation between the two diseases, and satisfactory results have been obtained. It will readily be understood how important a subject this is when we realize that the majority of the cattle imported from Britain into South Africa succumb to piroplasmosis before being out there very long. The results are satisfactory in so far as they prove that the *Piroplasma bovis* of this country has very different habits and pathological importance from the *P. bigeminum* which causes South African redwater, and also that an animal immunized against the British form is not thus immunized against the South African disease, and a movement is being made to provide a serum for inoculation into beasts about to be exported from Britain, and so to lessen the high mortality which occurs among recently imported animals in South Africa.

Many other points of interest are to be noticed, and on the whole one is impressed with the necessity of the present-day student having a thorough bacteriological training, otherwise he will be able to render little assistance in elucidating the phenomena of these most serious and transmissible diseases.

In a country like South Africa, where the prosperity depends so largely upon the animal community, it is easy to understand the importance of a number of well-equipped bacteriological laboratories for the study of disease, and the Transvaal is to be highly congratulated on its selection of such a distinguished veterinarian as Dr. Arnold Theiler. His published reports always give much food for thought, and it is to be hoped that the time is not far distant when his researches, and those of his colleagues, will eradicate the greater number, if not all, of the cattle scourges at present so prevalent in the country.

GLANDERS: A CLINICAL TREATISE. By William Hunting, F.R.C.V.S. Published by H. and W. Brown, 20, Fulham Road, S.W. Pp. 100, with 14 coloured plates and several photographs. Price 10s. 6d. net.

That the above treatise is a standard work goes without saying, for the name, great experience, and position of the author in the veterinary profession are quite guarantee of this. In his latest literary effort Mr. Hunting has surpassed himself and given to his colleagues a book which will be authoritative long after the disease which it discusses has become extinct. To praise it too highly would be impossible, for nothing to equal it has ever appeared before, and even the well-known energy of our Continental colleagues must yield on this occasion. The coloured plates and photographs are simply superb, so clear that no veterinary surgeon could possibly fail to recognize glanders from them alone, whilst the text is clear, lucid, and fully explanatory.

The publishers have done their share of the work, and to them should also be given a due share of praise.

No practitioner, either in town or country, should delay in adding the work to his bookshelf.

Miscellaneous.

The Steel Memorial Medal awarded for work done for the advancement of the profession has been awarded by the Council of the Royal College of Veterinary Surgeons to Professor O. Charnock Bradley, M.D., D.Sc., M.R.C.V.S., and will be presented to him at the next meeting of the Council.

The FitzWygram Prizes for this year have beeu awarded to Mr. F. M. Reynolds (London) first, and Mr. J. W. Morrow (Edinburgh) second. There were only three marks between the first and second candidates. The value of the first prize is £38 12s. 9d., and of the second £23 3s. 8d.

The officials of the Melbourne University are doing their utmost to make the newly adopted Veterinary Faculty a great success, and a number of them were present at a recent dinner, with Sir John Madden in the chair, given in honour of the new Principal, Mr. J. A. Gilruth, M.R.C.V.S., F.R.S.E. It is the only British Veterinary School south of the Equator, and great things are expected of it.

Mr. George Hewitt, a veterinary surgeon, living at Aldershot, died under extraordinary circumstances in a hansom cab at midnight on Monday. The horse suddenly bolted and ran up a bank, and the driver, on jumping down to attend to his fare, found Mr. Hewitt quite dead. Mr. Hewitt, it is stated, himself struck the horse with his stick because it did not go at the pace that he desired. Three years ago Mr. Hewitt inherited a fortune of £70,000 from an aunt.

Translations.

CONGENITAL MALFORMATION OF THE GENITALS AND RETENTION OF MUCUS IN THE WOMB AND VAGINA.

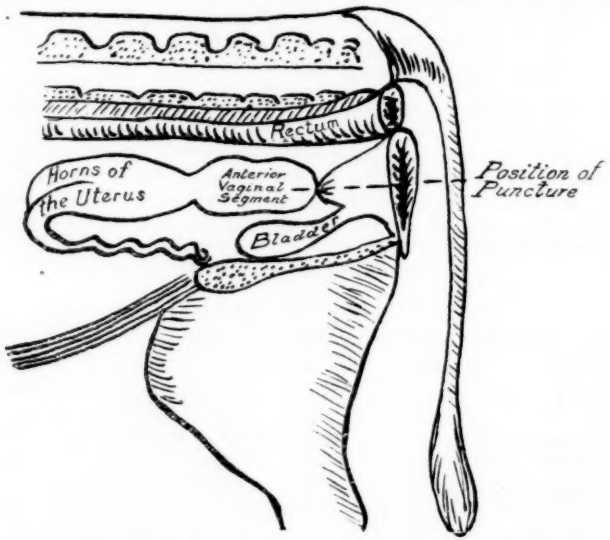
BY PROFESSOR MOUSSU, ALFORT.

In August, 1907, heifer, of Normandy breed, aged 18 months, was brought into the Alfort cattle clinique, showing the following symptoms of illness: After standing quiet for a time she lifted her tail as if about to dung and make water, and strained so violently that the anus protruded and the vagina was pressed out. At each straining a small quantity of dung and a few drops of urine were voided. In the stall this condition was so pronounced that the heifer had no rest or peace, and appeared as if about to abort or calve; but this was not the case, for she had never been to the bull, and these symptoms had been present for several weeks.

Appetite small, breathing regular but slow, blood circulation and temperature normal. Functions of the nervous system and of the urinary and reproductive organs much disturbed. The heifer was under the influence of strong intermittent expulsion reflexes, which happened irregularly and were repeated every few minutes. Vagina small, very narrow, and not normal. On exploring the rectum, only accomplished by much pressure, the following condition was noted: It ran in an upward direction and was flattened underneath in the

neighbourhood of the sacrum, so that only the flat hand could be passed further. It ran up directly under the pelvic arch, and then twisted right and left to the side wall of the pelvis. A long, hard, stretched and regularly rounded cylindrical mass could be felt with the hand, and could not be pushed either to the right or left. Going further with the hand, both uterine horns could be felt like two "black-puddings," as thick as one's arm, stretching forwards into the pelvic cavity. I now felt certain that this enormous mass in the pelvic cavity was none other than the deformed, greatly lengthened and distended uterine body, next to the anterior section of the vagina. This portion of the organ was so distended that it had the feel of the head of a fœtus, which was deceptive.

After exploration of the rectum, examination of the vagina was conducted. This was very narrow and only explored with difficulty, and at first only allowed admittance of two fingers. The exit of the urethral canal was in the right place, but just in front of this the



vagina narrowed into a cone-shaped point, and this point was situated just as far from the urethral exit as the exit was from the vulval lips. This exploration showed that the vagina was divided into two completely separated segments, a hinder segment ending blindly anteriorly, and an anterior segment. The diagnosis was: genital malformation with non-perforation of the vagina, complicated with retention of the secretion products of the uterus and vaginal mucous membrane in an enclosed genital sac. This malformation is mentioned in embryology. In the early days of life, when the genital organs are only vegetative, no disturbance occurs. At œstrum there is strong hyper-secretion of the mucous membrane and the malformation of the vagina gives it no exit, so it collects in the uterine horns, uterus and vagina, presses

the walls out and leads eventually to hindering defecation and urination. It is the anterior segment of the vagina that causes the difficulty in dunging and making water, and the reflex straining and deception as to a commencing calving.

The contents of the genitals were emptied by operation, and a regular passage with the outside world made. The vagina was dilated with a speculum. A trocar, 30 cm. long, was carried into the vagina and puncture of the distended portion made. About 12 to 13 litres of a greyish yellow flaky discharge was voided, and the heifer got ease.

In such cases, if the animal is soon to be slaughtered, this will suffice. If she has to be kept some time a further operation may be necessary. The vagina must be widened with the hand, using cocaine and a specially constructed dilator. Then rolled strips of iodoform gauze are pushed as far in as possible to keep the narrowed vaginal segments open.

This animal was soon feeding and got well, and remained healthy till she was slaughtered.

G. M.

(*Deutsche Thierärztliche Wochenschrift.*)

ETIOLOGY OF TUBERCULOSIS.

BY DR. RAVENEL, PHILADELPHIA.

THE possibility of tuberculous infection by the digestive tract appears to have been first noted by Klenke in 1846. He gives the history of sixteen children who presented tuberculous lesions of the intestine, abdominal glands, skin and bone, after having been fed on cow's milk. At the time, these observations were wanting in scientific basis.

Chauveau, Villemin, Gerlach, Klebs and Harms, and a great number of experimenters, proved transmission by ingestion in different species of animals.

What are the points of penetration of the bacillus? The mouth, the tongue, the palate and the gums furnish points of introduction. In tuberculous people myriads of bacilli soil these mucous membranes without making a lesion in them.

Tonsils.—Penetration is easy. Krückmann found the bacilli twice in the tonsils of twenty-five men who appeared healthy; Gottstein twice in twenty examinations; Pluder and Fischer five times in thirty-five; and Scheibner four times in sixty. Wood, in 1,671 cases found in literature reports, eighty-eight of primitive tuberculosis, or 5·2 per cent.

In a series of experiments in Philadelphia on the ingestion by swine of human and bovine bacilli, necrosis and primitive ulceration of the tonsils were often found. Baumgarten, Woodhead, Peira, Lexer, Wood and Aufrecht commented on the frequency of these lesions in rabbits and swine. Grober concludes from his studies that infection by the tonsils is the most frequent point of origin of tuberculosis of the upper part of the body. Invasion is direct by the cervical glands, pleura and lungs.

Pharynx and Œsophagus.—Tuberculosis of these organs is extremely rare, and primitive lesions are almost unknown.

Stomach.—Lesions are still very rare, and penetration by the mucosa is hardly probable.

Intestine.—The most frequent port of entry. Intestinal lesions vary from 30 to 90 per cent. in man, but in the great majority of cases they are secondary.

Some time before the discovery of the bacillus of Koch, Weigert remarked that in ltttle children the mucosa is easily penetrated, and that in these cases the mesenteric glands are found to be tumefied and caseous, but the mucous membrane and lymphatic vessels do not show any alteration. Tuberculosis of the mesenteric glands without lesion of the intestinal mucosa is noted by Cohnheim, Bollinger, Wesener, Heller, Aufrecht, von Hausemann, Rilliet and Barthez, Widerhofer, and numerous authors. Lydia Rabinowitsch shows that in children and adults living tubercle bacilli are found in the mesenteric and bronchial glands, when the mucous membrane does not present any appearance of a lesion even on microscopic examination. In feeding experiments, Orth produced lesions of the mesenteric glands without alteration of the intestine.

Numerous statistics furnish proof of the relative frequency of intestinal tuberculosis in man. Primary tuberculosis of the intestine is relatively rare; however, its reality is beyond dispute. On the other hand, experiment furnishes in this respect some precise information; it shows that pathological anatomy is powerless to disclose the port of entry of the bacillus in numerous cases.

Many pathologists think that normal intestinal mucosa is never penetrated, and that in this respect it behaves like other mucous membranes. However, infected glands are frequently found where no lesion exists on the surface. In swine infected by feeding, Ostertag finds the pharyngeal, cervical, and mesenteric glands tuberculous, whilst the intestinal mucous membrane is intact. "It seems to me from my experience that the penetration of tubercle bacilli is very easy during the digestion of fat."

Orth (1879) and Cornet (1880) have followed step by step bacilli introduced by the intestine without lesion of the mucous membrane, lymphatics and glands.

In the laboratory of Public Health of Pennsylvania, Ravenel often saw tuberculosis of the lungs and thoracic glands without intestinal lesions, or with insignificant ones, when virulent material had been given.

In 1902 and 1903 a series of dogs were infected by the stomach probang with an emulsion of butter and bacilli; infection occurred, although the mucosa was intact and care had been taken to previously purge the animals to avoid erosion of the mucosa by the intestinal contents. One knows in this respect the ideas of Roemer and von Behring on the *rôle* of alimentary infection in tender years.

The infection of man by bovine bacilli is directly demonstrated. The author has twice extracted bovine bacilli from the lesions of meningitis in children; in one case of primitive intestinal tuberculosis of children, a bovine bacillus virulent for calves was found. Schweinitz, Smith, and Mohler confirm this by their cases.

In Europe, Fibiger and Jensen, Wolff, Westenhöffer, the Imperial Institute of Hygiene, and the English Commission for the Study of Tuberculosis note numerous examples.

The conclusions come to by the work are:—

(1) The digestive tube is a frequent port of entry for tubercle bacilli.

(2) The tubercle bacilli penetrate by the digestive mucosa when intact without leaving traces of their point of penetration.

(3) Bacilli arrive with the chyle by the lymphatic vessels and thoracic canal in the blood. They are retained in great part by the pulmonary filter.

(4) Infection by the intestine is very frequent in children.

(5) The milk of tuberculous cows is in most cases the source of the contagion. In the present state of our knowledge the proportion of cases is uncertain, but it is probably high.

(6) Tuberculosis may be transmitted by contact, such as kissing, soiled hands, autopsy wounds, or cleaning utensils used by tuberculous people. These forms of contagion play only a small *rôle* in the origin of the malady.—G. M.

(*Revue Générale de Médecine Vétérinaire.*)

Correspondence.

To the Editors of the VETERINARY JOURNAL.

DEAR SIR,—Messrs. C. H. Huish and Co., of Red Lion Square, London, have made at my suggestion a bitch forceps, which should prove a great boon to the profession.

For hounds or bitches of similar size the existing forceps leave much to be desired, but the great length (18 in.) of these must at once appeal to the operator.

They are finished in the usual excellent style for which the firm are so well known.

Yours faithfully,

E. E. SELDON.

Cirencester.
October 15, 1908.

THE FRANK W. WRAGG MEMORIAL FUND.

To the Editors of the VETERINARY JOURNAL.

DEAR SIR,—A large number of the members of the veterinary profession having expressed a wish that some suitable memorial should be raised to perpetuate the memory of our late friend, Mr. Frank W.

Wragg, an invitation was issued, asking those who desired to serve on a committee to intimate their wish, and as result seventy-eight gentlemen from all parts of the kingdom have responded, and at the present time form "The Wragg Memorial Committee" (with power to add to their number).

The first meeting of this Committee was held at the Royal College of Veterinary Surgeons on October 8, when Mr. James F. Simpson was elected chairman, and Mr. Sidney Villar treasurer and secretary.

It was unanimously decided that until the Committee could form some definite idea of the amount likely to be contributed it would be impossible to decide as to what form the memorial should take.

It was, therefore, decided that the Chairman and Secretary should issue an appeal for contributions to enable the Committee to decide this detail at a later date. It is confidently hoped that there will be a large response to this appeal.

May we, therefore, ask the members of the profession to intimate to either of us the amount they individually wish to contribute to the Fund, and at the same time send a cheque for the amount?

We are, dear Sir,

Yours faithfully,

JAMES F. SIMPSON (*Chairman*),
Maidenhead, Berks.

SIDNEY VILLAR (*Treasurer* and *Secretary*),
The Common, Amersham, Bucks.

Books and Periodicals, &c., Received.

Diseases of the Dog and their Treatment, by Müller and Glass (Baillière, Tindall and Cox, 21s. net); Transvaal Department of Agriculture: Report of Government Veterinary Bacteriologist; Glanders—A Clinical Treatise by W. Hunting (H. & W. Brown, 20, Fulham Road, S.W., 10s. 6d. net); Board of Agriculture and Fisheries; Transvaal Agricultural Journal; Department of Agriculture and Technical Education for Ireland; Journal of the Royal Army Medical Corps.

Letters and Communications, &c.

Mr. Bevan; L. Dalrymple; Mr. Stent; Mr. Hunting; Mr. Mayall; Professor Craig; Mr. Sutton; Mr. Tait; Mr. J. F. Simpson; Mr. Villar; Mr. Oatley; H. & W. Brown; Mr. Seldon.

NOTE.—All communications should be addressed to c, Henrietta Street, Covent Garden, London, W.C. Telephone, 4646 Gerrard. Telegra , " Baillière, London."

Letters for the JOURNAL, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements), should be addressed to the Editor.

Manuscript—preferably type-written—should be on one side only of paper, marked with full name of author.

Illustrations for reproduction should be in good black or dark brown on white paper or card.

Advertisements and all business matters relating to the JOURNAL should be addressed to the publishers, Messrs. Baillière, Tindall and Cox.

DR. ARNOLD THEILER, C.M.G.

(Honorary Associate of the Royal College of Veterinary Surgeons; Chief Veterinary Bacteriologist to the Transvaal Government.)